FEB 1 - 1932

FEBRUARY

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

Gold Inlay Technic—*Volland and Paffenbarger*
Edentulous Patient—*Hooper*
Ultraviolet Ray in Periodontoclasia—*Rasmussen*
Production of Foci—*Downs*
Costs of Medical Care—*Beck*
Periodontal Infection—*Shea*
Radiodontic Interpretation—*Simpson*
Prophylaxis and Pyorrhea—*Hartzell*
Immunology of Dental Caries—*Jay et al.*
Children's Dentistry—*Rhobotham*
Dental Clinics in Europe—*Burkhart*
Subgingival Curettage—*Merritt*
Bone Cavities in Mandible—*Blum*
Research in Periodontology—*Leonard*

EDITORIALS
Dental Service for the Worthy—The Problem of Dental Caries

COUNCIL ON DENTAL THERAPEUTICS
Accepted Dental Remedies
Products Not Acceptable for A. D. R.

BUREAU OF PUBLIC RELATIONS
Health Program That Works—*Rochlin*

CONTENTS

Thomas L. Gilmer, D.D.S., M.D., Sc.D., F.A.C.S. (1849-1931) ..... Frontispiece

ORIGINAL COMMUNICATIONS

Cast Gold Inlay Technic as Worked Out in the Cooperative Research at the National Bureau of Standards and Applied by a Group of Practicing Dentists.
By R. H. Volland, M.Di., D.D.S., M.D., D.Sc., F.A.C.D., and George C. Paffenbarger, D.D.S. 185
Instructions for the Edentulous Patient.
By B. L. Hooper, D.D.S. 205
The Place of Ultraviolet Ray in the Treatment of Periodontoclasia.
By A. T. Rasmussen, D.D.S., F.A.S.S. 216
Experimental Production of Foci of Infection.
By William G. Downs, Jr., D.D.S., A.M., Ph.D. 224
A Preliminary Summary of the Facts Pertaining to Dentistry contained in the Published Reports of the Committee on the Costs of Medical Care.
By Dorothy Fahs Beck 230
Influence of Periodontal Infection on Paranasal Sinuses.
By John J. Shea, M.A., M.D. 251
Advanced Radiodontic Interpretation.
By Clarence O. Simpson, M.D., D.D.S., F.A.C.D. 256
Prophylaxis and Pyorrhea.
By Thomas B. Hartzell, M.D., D.D.S. 260
Preliminary Studies on the Immunology of Dental Caries.
By Philip Jay, M.S., D.D.S.; Mary Crowley, M.S., and Russell W. Bunting, D.D.Sc. 265
The Import of Children's Dentistry.
By F. Blaine Rhobotham, D.D.S., F.A.C.D. 270
Children's Dentistry at the Eighth International Dental Congress; The Organization of Children's Dental Clinics in Europe.
By Harvey J. Burkhart, D.D.S., LL.D. 275
Treatment of Periodontoclasia by Subgingival Curettage.
By Arthur H. Merritt, D.D.S., F.A.C.D., F.A.A.P. 279
Unusual Bone Cavities in the Mandible: A Report of Three Cases of Traumatic Bone Cysts.
By Theodor Blum, D.D.S., M.D. 281
Research in Periodontology: A Plea for Laboratory Experimentation.
By Harold J. Leonard, D.D.S., B.A. 302
Why the Dentist Needs to Have a Knowledge of Certain Fundamentals of Nutrition.
By Arthur L. Walters, D.D.S. 306
Artistic Aspects of Dentistry.
By Joseph Bisaha 313

EDITORIAL DEPARTMENT

Dental Service for the Worthy. — The Problem of Dental Caries. — Undignified Publicity in Dental Society Programs. — Edward Hoffmeister, A.B., Phar.G., D.D.S. (1870-1931). — Thomas Lewis Gilmer, D.D.S., M.D., Sc.D., F.A.C.S. (1849-1931). 316-324

COUNCIL ON DENTAL THERAPEUTICS

Accepted Dental Remedies 325
Kolynos Dental Cream—Not Acceptable for A. D. R. 328
Dr. Hand's Teething Lotion—Not Acceptable for A. D. R. 330
Dr. Hubbel's Formula—Not Acceptable for A. D. R. 332

BUREAU OF PUBLIC RELATIONS

A Public Dental Health Program That Works.
By A. S. Rochlin, D.D.S. 335
A Chalk Talk on Preventive Dentistry and Oral Hygiene for School Children.
By H. A. Boysen, D.D.S. 341

CURRENT LITERATURE

Extracts and Abstracts 345

MISCELLANY

Book Reviews 349
Social Insurance and the Fundamental Principles of Democratic Government 351
Dentists Among Recent Contributors to General Literature 352
Correspondence 352
News 352

Announcements 354

ADVERTISEMENTS

Index to Advertisements A-47
Classified Section A-41

The Journal of the American Dental Association, Vol. XIX, No. 2. Published by the American Dental Association, 212 East Superior Street, Chicago, Ill. Yearly Subscription, $2.50. Entered as second-class matter, May 1, 1928, at the postoffice at Chicago, Ill., under the act of Aug. 24, 1912. Published monthly.

THOMAS L. GILMER, D.D.S., M.D., Sc.D., F.A.C.S.
1849-1931

THE JOURNAL
of the AMERICAN DENTAL ASSOCIATION

Vol. 19 FEBRUARY, 1932 No. 2

Original Communications

CAST GOLD INLAY TECHNIC AS WORKED OUT IN THE COOPERATIVE RESEARCH AT THE NATIONAL BUREAU OF STANDARDS AND APPLIED BY A GROUP OF PRACTICING DENTISTS*

By R. H. VOLLAND,† M.Di., D.D.S., M.D., D.Sc., F.A.C.D., Iowa City, Iowa and GEORGE C. PAFFENBARGER,‡ D.D.S., Washington, D. C.

GENERAL PROBLEMS IN INLAY CASTING

CONSIDERABLE work has been done on inlay casting as regards both materials and technic. This paper will be a synthesis of much of this work.

We all realize that it is possible to arrive at conclusions in a research laboratory that are not always directly applicable in practice. Statements have been made that this work was too theoretical and was probably not of much direct benefit to the dentist. Today, much of this work will be presented both in theory and in practice and you may judge for yourself.

We will outline the problem of inlay casting, the properties of inlay waxes and inlay casting investments and the effects resulting from their use. This will include an extensive collaboration of theory and practice.

INLAY CASTING PROBLEMS

Much has been written on inlay casting. Many of the writers had no conception of the definite physical properties of the materials used. Consequently, there was, with probably one exception, little intelligent and coordinated research on casting inlays. It was generally recognized that gold shrank when cast and that the inlay would, for that reason, be small and therefore unsatisfactory.

Inlay casting is an intricate process

*Read before the Section on Operative Dentistry at the Midwinter Clinic of the Chicago Dental Society, Jan. 20, 1932.

†Chairman, Bureau of Standards Committee of the Research Commission of the American Dental Association.

‡Research associate of the American Dental Association at the National Bureau of Standards.

and probably always will be so, as all of the materials used in the process are subject to volumetric change. It is a happy circumstance that these changes can be so controlled that the inlay will be approximately the same size as the original wax pattern. In order to control these changes intelligently, one must know the physical properties of the materials used and how the particular technic which he is using will affect them.

It has been determined that the casting shrinkage of dental gold alloys is approximately 1.25 per cent. The expansion and contraction of inlay casting waxes and inlay casting investments have been studied and the values determined and published. They may vary widely for different types of material, as will be shown presently. The secret of the entire process is the balancing of the gold shrinkage with the expansion of the wax pattern or the investment, or both. It will be explained later why it is not feasible to procure all of the expansion at the expense of the wax. With many recent technics, some of the desired expansion has been obtained on the wax and some on the investment. It is now possible to procure the entire amount in the investment alone. This is probably the most satisfactory and consistent method of the three. However, we have no desire to urge its adoption. It is preferable to try all technics and select the one best suited to one's needs.

Figure 1 shows graphically the effects of various technics on the casting. Direct and indirect technics both faulty and good are shown.

It is practically impossible to cast satisfactory inlays with some recommended technics and materials. Diagram 1, Figure 1, illustrates this. We start on the zero line with the wax pattern in place in the tooth. Withdrawing the pattern and allowing it to come to room temperature causes it to shrink. It may be more or less than 0.5 per cent according to the degree range between mouth temperature and whatever the room temperature happens to be. Therefore, when we invest the pattern, it will be about, say, 0.5 per cent smaller than when it fitted the cavity. Now, if an inferior investment is used or the casting is made in a cool or cold mold, there will be still more shrinkage. This, of course, will vary with the technic and material used. It can be as much as 2 per cent. (Fig. 5.) Let us assume that we have selected an investment having only 0.3 per cent shrinkage. This must be added to the shrinkage of the wax pattern from mouth to room temperature. Thus, the mold into which we are going to cast is 0.8 per cent smaller than the original wax pattern. We must add to this the 1.25 per cent casting shrinkage of the gold alloy. Castings made with this technic and materials will be about 2 per cent undersize. An operator may be very dextrous, but it will be impossible for him to have satisfactory results with the materials and technic just described.

Diagram 2, Figure 1, pictures the effects of another unsound method. Some, but not adequate, expansion of the wax and investment is obtained. When the pattern is withdrawn from the cavity and then allowed to assume room temperature, we again have a shrinkage of, say, 0.5 per cent. An effort was made to compensate for this shrinkage and the anticipated gold shrinkage by expanding the wax pattern, say, 0.9 per cent. This will cancel the wax shrinkage of 0.5 per cent and make the mold 0.4 per cent larger than the original wax pattern. Then, an investment is used in which 0.4 per cent expansion is realized. Perhaps the investment is a very mediocre

one, or it may be a very good one but was not carried to a high enough temperature to obtain its maximum expansion. We are now ready to cast and have a mold which is 0.8 per cent larger than the pattern. When the casting is made, the 0.8 per cent must be subtracted from 1.25 per cent, a casting 0.4 per cent undersize resulting. This will doubtless be an improvement over many technics now used, but it is so easy to go the rest of the way that it seems a pity not to do so.

These two faulty technics are typical examples of those in use today by many dentists and technicians. There is definite evidence that the high plaster investments and the cold mold technics are being relegated to the junk heap of personal indorsement; a sorry reminder of their empiricism.

Diagram 3, Figure 1, shows that it is very possible to obtain overexpansion or overcompensation and thus have an inlay which is too large. This type of casting will be as unsatisfactory as the undersized ones.

Diagram 4, Figure 1, demonstrates how good materials correctly used will give castings of correct size. Let us consider the direct technic. If a greater temperature difference than in the former case is assumed, the wax pattern again shrinks on withdrawal from mouth to room temperature, say, 0.6 per cent. The wax pattern is expanded by any appropriate method 1.1 per cent, making the pattern 0.5 per cent larger than it was when in the tooth. With a good investment properly used, 0.7 per cent expansion can be realized. Then the mold will be approximately 1.25 per cent larger than the original wax pattern and the casting shrinkage of the gold will then be canceled, a satisfactory casting as far as size is concerned resulting.

Diagram 5, Figure 1, illustrates almost the same conditions except that almost all of the expansion is obtained by the investment. Whether the desired expansion is obtained for the wax and the investment both or each depends entirely on the operator and the material he uses. It is obvious that the technic using investment expansion alone is most consistent and simple.

Diagrams 6 and 7, Figure 1, apply to the indirect technics. They involve the use of an impression material such as modeling compound and model materials such as amalgam or cement. Impression compounds like waxes shrink when allowed to assume room temperature and an impression of the cavity will be smaller than the original impression. Assume that it is 0.3 per cent smaller. This must be equaled by the expansion of model material or by wax expansion. The balance of the expansion must be obtained by either wax and investment or by investment expansion alone.

It is hoped that this will clarify the problem of inlay casting and give us a comprehensive conception of what is needed. The profession will largely be helpless until the manufacturer gives the physical properties of such of his materials as pertain to dentistry. Then only can they be intelligently used. That time is fast approaching. Several manufacturers have already done so. One has published the values on all of his calcium products. He produces several investments, some good and some inferior. His published values show this distinctly. One of these investments showed thermal expansion of approximately 1.00 per cent; another, a shrinkage of 0.25 per cent. Yet the one showing the shrinkage is used extensively. Evidently, some dentists insist on poor material. Naturally, as long as the material is demanded, it will be sup-

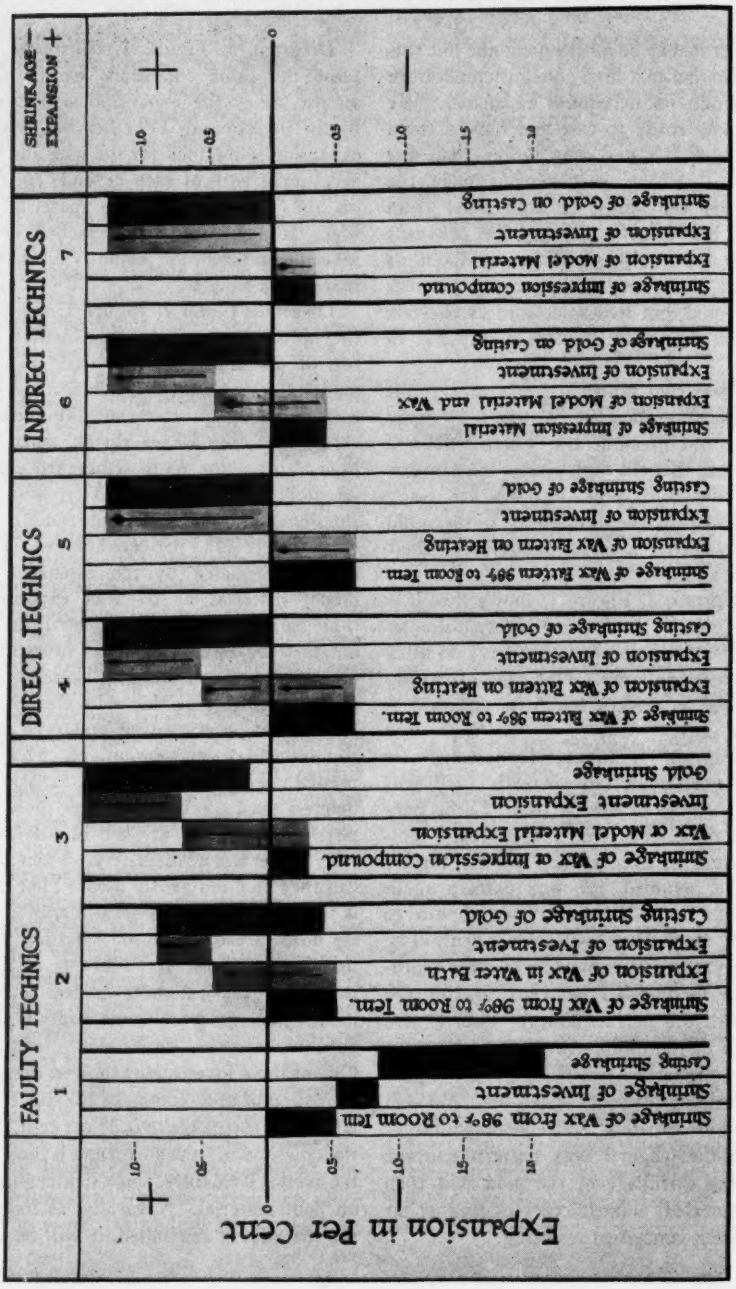


Fig. 1.—Inlay casting problems.

plied, and no one can find fault with the manufacturer since he tells the trade the faults of the material. This situation indicates that many members of the profession are careless. It is high time that these facts be recognized, that the physical properties of the materials used be studied and that the actual results of any technic that is employed be checked before any materials or a definite technic is finally adopted.

INLAY CASTING WAXES[1]

Inlay waxes are mixtures of complex compounds. The commercial waxes usually contain paraffin, ceresin, carnauba, beeswax and oil soluble colors. While their chemical properties may not be completely specified, their physical

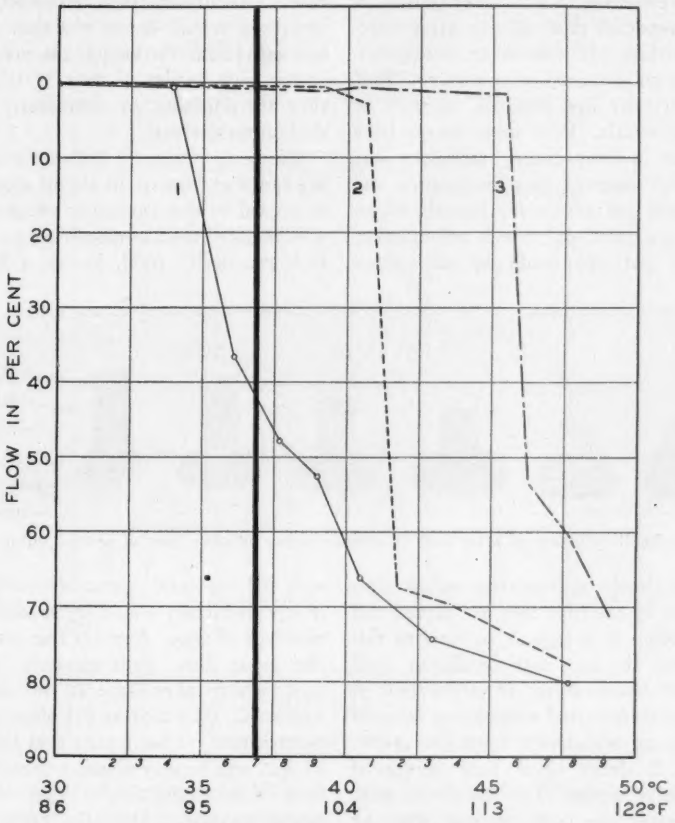


Fig. 2.—Flow curves of three inlay waxes.

1. Parts of this discussion have been published: Paffenbarger, G. C., and Sweeney, W. T.: Dental Casting Technic: Theory and Practice. J. Dent. Res., 11:681 (Oct.) 1931.

properties in relation to their dental uses are of most significance to us. These can be and have been studied.

Inlay casting waxes are an important link in the chain of materials that are used in inlay casting. Not only must their physical properties be understood, but the effect of the technic employed on their properties must also be given careful attention. It is no mean accomplishment to make a good inlay pattern. Skill and dexterity are required, as well as good materials. Poor inlay waxes have no place in inlay casting technics. Let us study some of their properties and then each can decide for himself which waxes are good and which are inferior.

Wax patterns made by the direct method closely approximate mouth temperature by the time they are carved and burnished. It is logical, in view of this fact, that the wax shall be almost rigid at body temperatures in order that it will not be distorted when being adapted to or being withdrawn from the cavity. Figure 2 shows three flow curves of three inlay waxes. The softer the wax, the greater the flow. A soft wax, an ideal wax and a hard wax have been purposely chosen to emphasize the vast difference in commercial articles now supplied to the dentist. A heavy line has been drawn through the chart to indicate body temperature. Attention is directed to wax 1, Figure 2, which has a flow of almost 43 per cent at mouth temperature. We can visualize what this wax would do in a practical case. Extreme care would have to be exercised to remove a pattern from the cavity. Painting and investing would cause distortions unless done at a low temperature. Use of this low temperature, in investing, would defeat the wax expansion operation. As long as the profession accept such grades of wax as this one, they are imposing an unnecessary hardship on themselves.

Curve 2, Figure 2, shows the softening range or flow of an almost ideal wax in regard to this particular property. It will be noted that, at mouth temperature, it is practically rigid, having a flow of only 0.8 per cent. Certainly, very little if any distortion would be possible with this type of wax. Another fine feature is the great flow, approximately 68 per cent, which takes place at just about 4 degrees C. (7.2 degrees F.) above mouth temperature. That means that this type of wax will be very plastic and will facilitate fine impression taking without undue heating. Also, the temperature range between its rigid and plastic conditions is narrow. The shorter this range, the less the shrinkage of the wax when worked in direct technic, and also the less the difficulty from the production of hair line cracks on the interior surface of the pattern. The flow curve shows

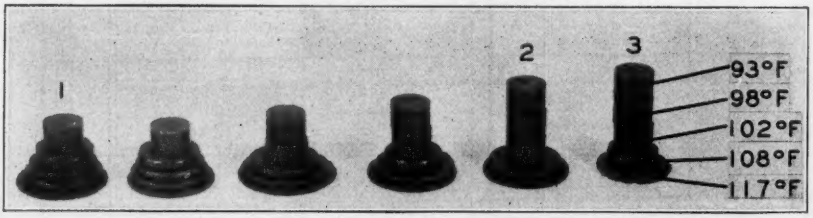


Fig. 3.—Small cylinders of wax used in demonstrating relative flow of several inlay waxes.

that inlay wax 3, Figure 2, is too hard for the average dentist to work successfully, although it is used successfully by several dentists who understand this difficulty. They are certainly well protected against distortions of pattern. It is quite rigid at body temperature, having only a 1 per cent flow. The plastic or impression taking stage is not reached until 46 C. (114.8 F.) or 9 C. (16.2 F.) above mouth temperature, and while it offers the maximum in wax expansion technics, it is unnecessarily high and therefore extremely difficult to manipulate.

Figure 3 shows the relative flow of several inlay waxes. The test specimens were small cylinders of wax, 6 by 10 mm. Five of these were used in the test. Wax specimen groups 1, 2 and 3, Figure 3, correspond to flow curves 1, 2 and 3, Figure 2. The top cylinder of each group is heated to about 93 F. As shown by the specimens, there was very little flow. The next temperature was about 98 F. In group 1, Figure 3, the 98 F. specimen is very flat; while, in 2 and 3, Figure 3, it is still holding up. The 102 F. specimen is still holding up in 2, Figure 3, while the 108 F. specimen has flattened appreciably.

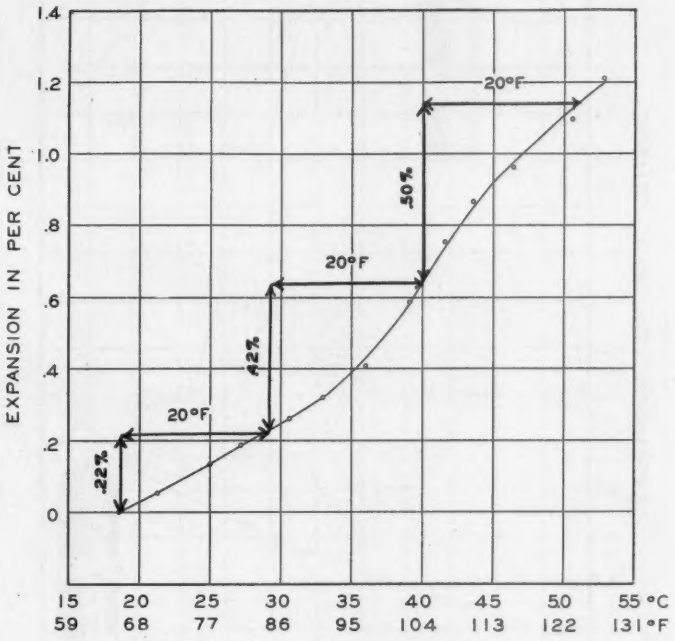


Fig. 4.—Thermal expansion curve of an inlay wax.

Another important property of inlay waxes which is essential in inlay technics is thermal expansion. It is readily understood that if we are going to use any method of wax expansion intelligently, we must have definite figures for this property.

Figure 4 shows the thermal expansion curve of a good inlay wax. This is the same wax which possessed the best flow curve. Particular attention is directed to the fact that the amount of expansion varies over different degree ranges. Thus, this wax expands 0.22 per cent in the 20 F. range between 64 F. and 84 F. In the next 20 degree F. range (84-104 F.), the expansion amounts to 0.42 per cent, which is almost double that in the lower range; while, in the next 20 degree F. range (104-124 F.), the wax expands 0.50 per cent, more than double the first 20 degree F. range. These different expansions in different temperature ranges drive home one important fact which must be taken into account in any method employing wax expansion. It is obvious that one cannot say, "In-

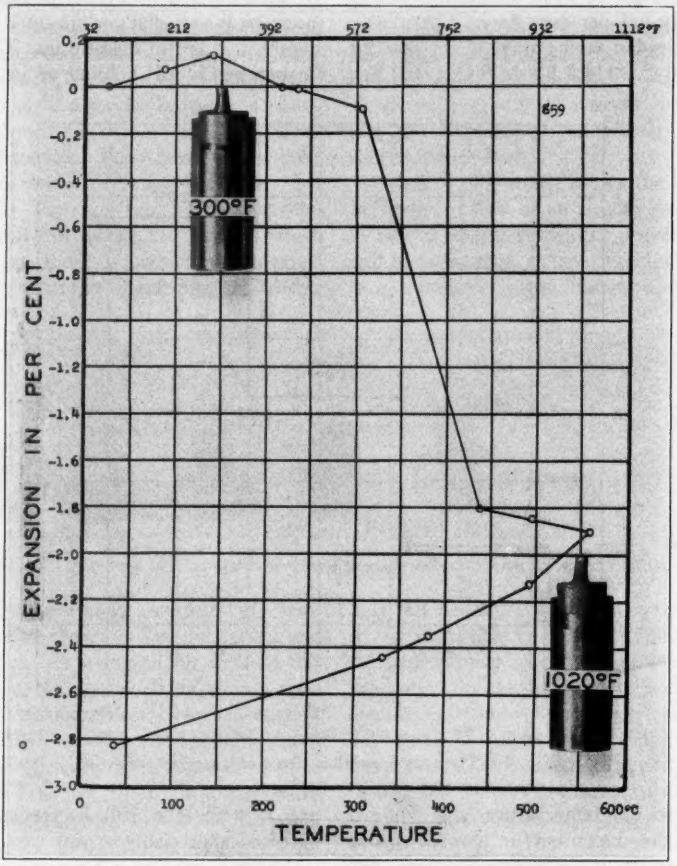
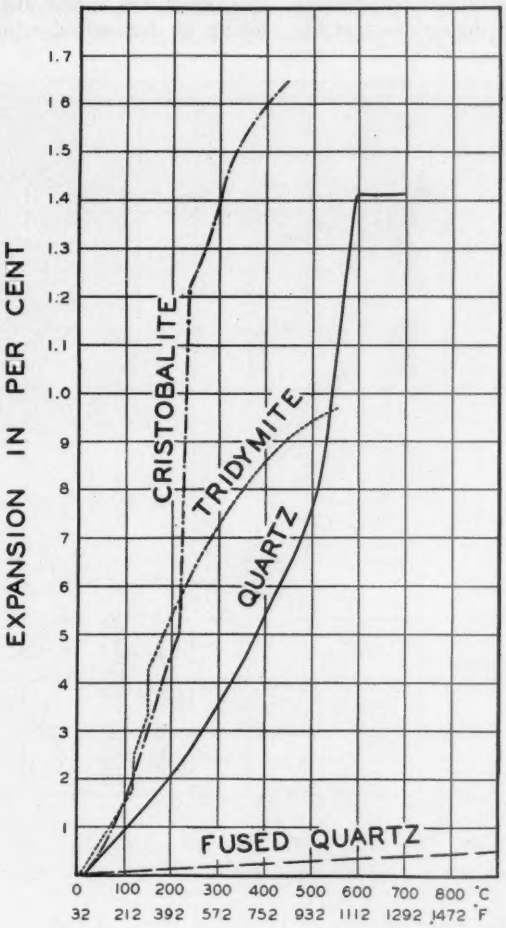


Fig. 5.—Thermal expansion curve of plaster of Paris.

vest the wax and carry it up 20 F.," for if we invest at room temperature, which may be 64 F. and carry it up 20 F., the pattern would be only 0.22 per cent larger. If the room temperature was 84 F. and we did the same thing, the pattern would, of course, be 0.42 per cent larger. This may explain some of the inconsistencies of the many heterogeneous wax expansion technics. Also, if one is using wax expansion on a pattern made by the direct method, he must



Cristobalite (Braeseo) Tridymite (Braeseo). Quartz (Braeseo). Fused silica (Souder and Hidnert)

Fig. 6.—Thermal expansion curves of four forms of silica.

begin expansion calculations at mouth temperature, as it was at that point that the pattern was in adaptation to the cavity. The expansion of the pattern from room temperature to mouth temperature simply counteracted the shrinkage of the pattern when it was withdrawn from the tooth and came down to room temperature.

The wax expansion technics proposed around 1910 were practically discarded by the profession for a period of years, but were resuscitated and have been rather extensively used in various forms during the last three or four years. This renaissance was largely due to the publishing of definite values for wax and investment expansion. At the present time, the trend seems to be away from it, owing largely to the development of high expansion investments, some of which are able to compensate for all of

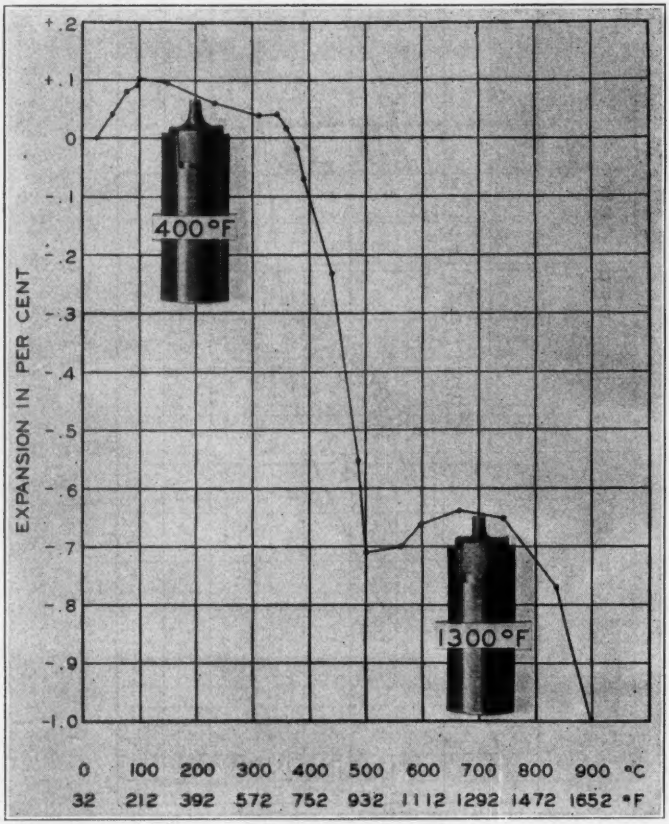


Fig. 7.—Thermal expansion curve of 55 per cent plaster of Paris investment.

the gold contraction. Certainly attempts to compensate for more than half of the gold shrinkage by wax expansion are unnecessary and complicated.

Water bath castings are often very rough, especially on the inner surfaces. probably free water separated or sucked from the investment. In using water bath technics, great caution must be used in keeping the bath free from vibration. Any vibration seems to cause free water or a very thin mixture of water and

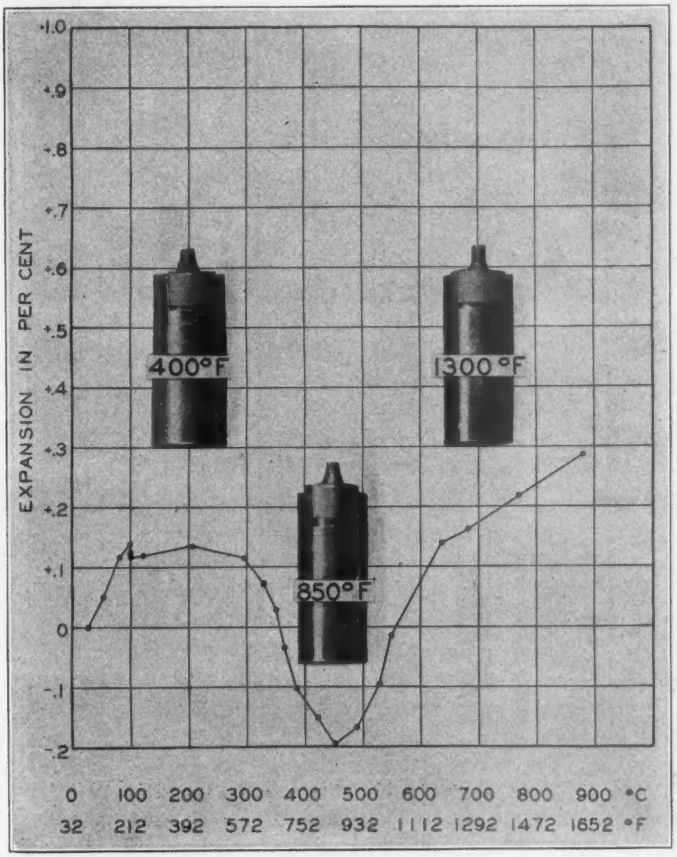


Fig. 8.—Thermal expansion curve of 40 per cent plaster of Paris investment.

This is possibly due to the imperfect filling in of the space created by the expanding of the wax with a very thin mixture of investment or, in some cases, investment to segregate from the investment and to congregate on the wax pattern. This water apparently etches (actually it pushes the investment away

from the pattern) the surface of the mold and causes a characteristic roughness. This was proved by a series of experiments. Two water baths were used, one being placed where it would be subject to vibration. In this particular instance, a polishing motor was in operation on the same table. The control bath was placed in a position where it would be undisturbed. The castings made in investments subject to the almost imperceptible vibrations of the polishing motor during setting were invariably rough, while those in the control bath were smooth.

Wax is an unusually difficult material to work accurately in most water bath or other wax expansion technics. This is probably also due to such properties as its very high and variable coefficient of expansion, its weakness at slightly elevated temperatures and its tendency to

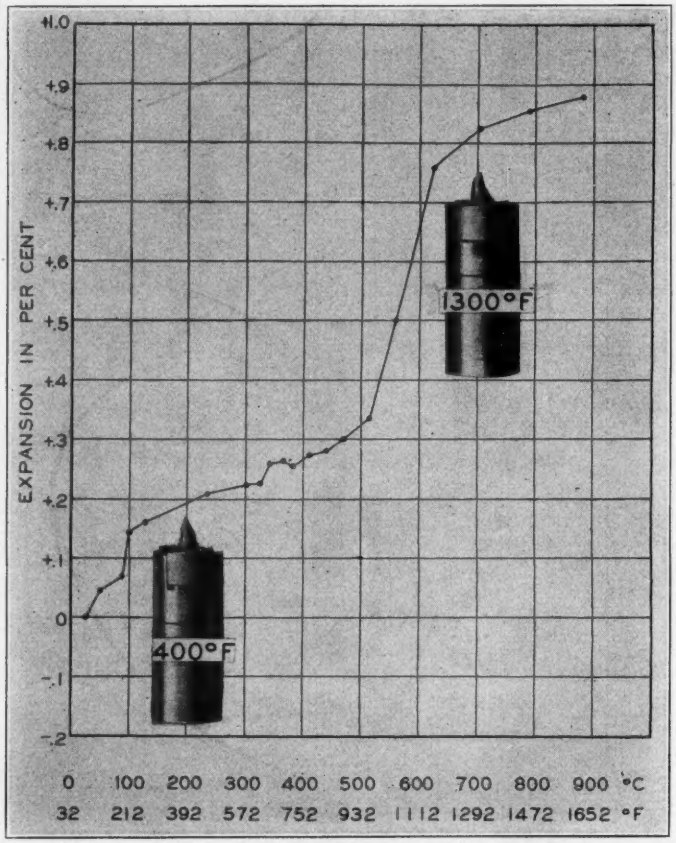


Fig. 9.—Thermal expansion curve of 25 per cent plaster of Paris investment.

return to its former position after being heated, chilled, stressed and then reheated. Perhaps these three conditions go a long way toward explaining the wax expansion enigma. Again, to refer to Figure 3: It is difficult to understand how seems to point out the fact that the wax will probably expand without distortion up to a certain point. Most of us are familiar with the distortion of the wax pattern and can readily comprehend why it is so undependable when subjected to

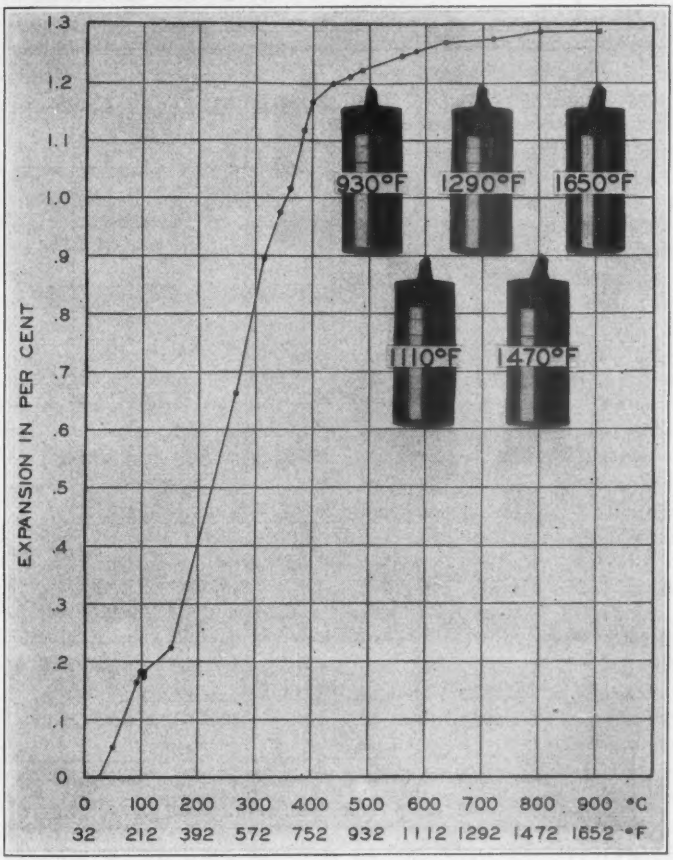


Fig. 10.—Thermal expansion curve, cristobalite investment.

a crown pattern weakened by the higher ranges of most water expansion technics is going to be able to displace a mix of investment in a closed ring. Experience expansion temperatures as suggested in many wax expansion technics, without the least information on physical properties of the materials used.

We know that we must have a mold approximately 1.25 per cent larger than the wax pattern was when it fitted the cavity. We also know that the wax expansion process is used by some operators to procure all or part of this enlargement. Is not it logical, in face of the treacherous properties of the wax, to procure only the minimum expansion by this method and to make the investments assume most of this burden? The properties of investments will be taken up next, especially the thermal expansion of investments of various compositions under different technics.

This paper must not be interpreted as outlining any one wax or expansion technic. An individual technic must be developed which can be done in such a manner that every step of the operation will be understood. The overexpansion or excessive expansion, the underexpansion or defective expansion and most of the reasons for the difficulties arising in

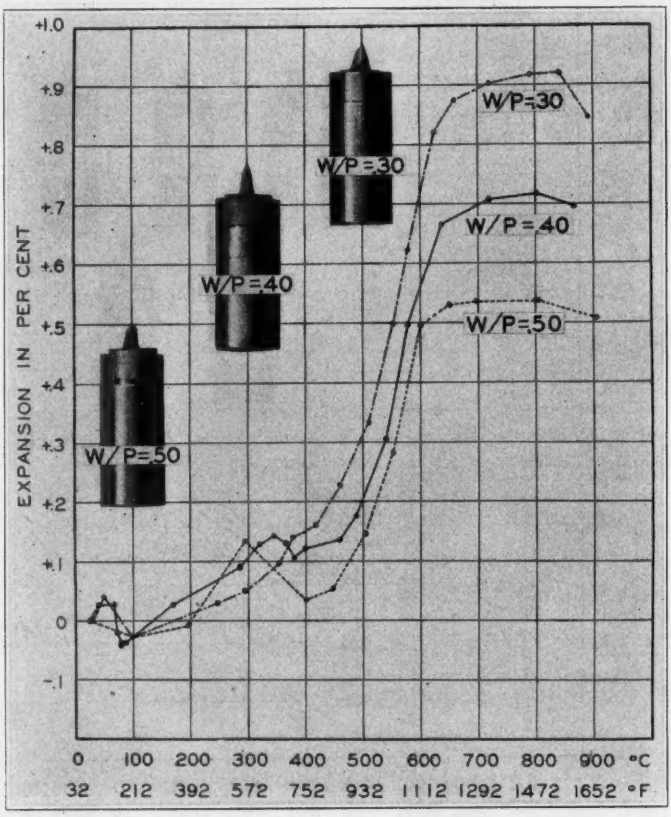


Fig. 11.—Thermal expansion curves, 20 per cent plaster of Paris investment.

casting operations can then be recognized. Until this problem is studied, we may be purchasers of materials, imitators or helpless struggling operators.

At Memphis, the men who demonstated the feasibility of various technics were able to develop their technics and to get results only because they were familiar with the physical properties of their materials and their utilization.

INLAY CASTING INVESTMENTS

The work on inlay casting investments will attempt to show how the physical properties of the investment used will affect the size of castings and, further, how these properties affect various technics.

In the literature on dental gold castings, investments have perhaps played a major rôle. The diversity of opinions on the desired composition and use of investments is appalling. They range all the way from support of the cold to adherence to the cool to the hot molds, from slow to rapid elimination of water and wax, from investments of pure plaster to those of very low plaster content, thin mix, thick mix, single investment, double investment, painted on the pattern, vibrated on the pattern, etc. The astounding thing about these contentions has been the utter lack of supporting data for any technic other than that overworked expression, "in my hands."

Plaster of Paris and quartz (SiO_2) are the principal ingredients of nearly all of the commercial investments. The percentages of plaster of Paris in the investment may be as high as 60 per cent or as low as 20 per cent, depending on who makes it. As shown in Figure 5, when plaster of Paris is heated, it first expands slightly, approximately 0.15 per cent. After the water is driven off, it shrinks very rapidly, so that at about 1000 F., the specimen is over 1.8 per cent shorter. Castings can be made in plaster of Paris as shown in Figure 5. The castings are placed on the curve at approximately the temperature at which they were cast. Their size verifies the data shown by the curve.

Figure 6 shows the thermal expansion of four different forms of silica (SiO_2). They are alike chemically, but differ in their physical behavior. Quartz (sand) is the chief ingredient of most investments. Its curve goes up above 1.4 per cent at about 1000 F. This is a very different picture from that of the curve for plaster which showed a shrinkage of over 1.8 per cent. Thus, most investments consist of various mixtures of an expanding and of a contracting material. Hence, we may expect that the curve for each mixture will vary according to the amount of each ingredient present. The other curves (Fig. 6) show the thermal expansions of cristobalite, tridymite and fused quartz. The last is very low; while cristobalite has the greatest expansivity and would be excellent for dental use if it could be made available at a reasonable price.

Figure 7 is a thermal expansion curve of a 55 per cent plaster content investment. We could readily have predicted that the behavior of this material would be almost as faulty as that of plaster as far as shrinkage is concerned. The slight expansion due to the quartz content is noticeable between 930 and 1300 F. Castings made in this investment are shown on the curve at their approximate casting temperatures. Perhaps they are slightly less defective than the ones cast in plaster of Paris. They are, of course, unsatisfactory for dental use.

Figure 8 shows a thermal expansion curve of an investment containing 40 per cent plaster of Paris. The small initial

expansion of about 0.13 per cent is followed by a shrinkage down to 0.2 per cent because of the 40 per cent plaster content. This is then followed by an expansion because of the quartz content up to almost 0.3 per cent. Of course, the investment is not a very desirable one, because of its low expansion; the maximum being less than 0.3 per cent at high temperatures. If we were to use this investment, it is rather obvious that the poorest casting temperature would be around 900 F. The pictures of the three castings are shown in Figure 8 at their approximate casting temperature.

Figure 9 is a thermal expansion curve of an investment containing 25 per cent plaster of Paris. Figures 8 and 9 give the thermal behavior of an inner and outer investment, respectively, for a commercial technic. It is unfortunate that the investment shown in Figure 9 was not the inner one, as it is a very satisfactory investment. This has an almost continual expansion up to red heat. Two castings are shown, placed on the curve at their approximate casting temperatures.

From these curves and castings, we can all readily see how the composition of an investment will affect the size of the casting, the low plaster content type being very superior because of their high thermal expansion. Also, that the selection of a correct casting temperature is pertinent, if we are to realize the maximum expansion. This means that we must cast into hot molds made of high expanding investment.

Figure 10 shows the thermal expansion curve of an investment containing 25 per cent plaster of Paris and 75 per cent cristobalite. This curve differs from those of the ordinary plaster-quartz investments in that its highest expansion is about 1.25 per cent at 1000 F. and it has practically the same expansion between 1000 and 1600 F. Thus, there is a range of several hundred degrees where one could cast and be assured that he would have the maximum expansion. Also, there are no serious depressions in the curve, which has an almost continual expansion at a relatively low temperature as compared with the plaster-quartz investments. Five castings made at 100 degree C. intervals are shown on the curve at about the temperatures where they were cast. This shows that all of the gold contraction can be canceled by investment expansion.

Figure 11 shows three curves, all of the same investment. The investment contains 20 per cent plaster and 80 per cent quartz. They were treated alike except that the amount of water used in mixing them was varied. The one having the lowest expansion has the most water, 50 c.c.; the next had 40 c.c. of water, and the one with the highest expansion had approximately 30 c.c. of water in 100 gm. of investment powder. The thicker the mix, the greater the thermal expansion. Three castings were made, with the same material and same technic except that the water content of the mixes was varied as in the thermal expansion samples. The photographs of the castings are placed adjacent to the curves having the same mix as they had. Here, again, we have a correlation of the theoretical physical data and actual dental castings of a most severe type.

Setting expansions of investments must also be considered. Most of them have setting expansions of around 0.2 per cent. This must be added to the thermal expansion of the investment in figuring for the compensation expansion of 1.25 per cent.

These curves and castings demonstrate that to make a casting of predetermined size, we must work with materials hav-

ing known and definite physical properties. As some manufacturers are publishing the physical data of their investments, it is possible to obtain commercial materials with known properties.

It is our opinion that part of the development in this field has come from the cooperative dental research at the National Bureau of Standards.[2] The work within the walls of the Bureau is often highly technical and, with the unusual precision equipment under definite control, it may sometimes happen that the practical results may be difficult to duplicate in the dentist's laboratory. This means that the findings of the research laboratory should be followed until they are interpreted in terms practical for the average dentist. With this aim in view, the Research Commission of the American Dental Association has given particular attention to these practical applications during the last two years. Volunteer clinicians have been selected by the Commission in a number of localities. They have been guided, when necessary, in a systematic study of the theoretical data underlying inlay technic.[3] They have been supplied with materials unknown to them, some known to be defective, and have been asked to make inlays using these materials. Their attention has been directed to literature describing technics, some likewise known to be defective, and they have been asked to make inlays by these technics. Data on the physical properties of the materials used were then given these operators. Likewise, their attention was called to the conditions essential for any satisfactory technic. They were then requested to give reasons for the corresponding success or failure of each material or technic used. After mastering this phase of the work, they were requested to select materials and equipment, to outline and present on their own responsibility a clinic at the Memphis meeting of the Association. Neither the Bureau nor the Research Commission exercised any supervision over the selection of the materials or technics to be used except to assist in organizing the efforts of the different groups in order that all factors relating to the production of dental inlays should be stressed by the combined group clinic.

The following clinic outlines are those used by the individual clinicians and city groups as arranged at Memphis. Drs. V. V. Bele, J. W. Brown, E. E. Merriman, O. P. Snyder, H. A. Swanson and R. L. Morrison assisted members of the Bureau staff in demonstrating equipment and testing methods. The authors reproduce these outlines with the permission of the clinicians.

CASTING TECHNIC

(H. Hayward Streett, Harry B. McCarthy, Baltimore, Md.)

Results in casting using materials whose definite physical properties are known.

1. Direct or indirect method.
2. Taggart's wax:
   Wax expansion, temperature of bath about 95 F.; time in bath, 30 minutes; expansion varies with room temperature.
3. R & R gray investment, water 30 c.c., investment 100 gm.
   R & R green investment, water 40 c.c., investment 100 gm.
   Coecal universal investment, water 25 c.c., investment 100 gm.
   Kerr's mechanical spatulator—35 full turns of handle; room temperature water used.
   Time of set: R & R gray, 14-18 minutes; R & R green, 18-20 minutes; Coecal universal, 15-20 minutes.
   Setting expansion: R & R gray, 0.45 per cent; R & R green, 0.35 per cent.

2. With other departments of the Government (1919-1922); with the Weinstein Research Laboratories (1922-1928), and with the American Dental Association (1928-).

3. N. O. Taylor, until recently research associate of the American Dental Association, arranged much of the material used in this study.

Coecal universal, 0.35 per cent.
Ring lined with asbestos.

4. Elimination begun after final set has taken place.
   Entire heating time, 20 minutes if furnace is at maximum heat.
   Maximum temperature, 1200-1300 F.
   Smoother castings are obtained if molds are heated slowly until moisture and wax are eliminated.
   Thermal expansion:
   R & R gray, 0.85 per cent.
   R & R green, 0.70 per cent.
   Coecal universal, 0.92 per cent.
   Total expansion, 1.30, 1.05, 1.27 per cent, respectively.
5. Casting: Perfection centrifugal casting machine; oxygen and gas used as fuel.

DIMENSIONAL CASTINGS

(J. D. White, Max Kornfeld, E. Mayer, St. Louis, Mo.)

(This demonstration shows that both wax and investment expansion are necessary in the production of more accurate castings.)

(*a*) One pattern will be invested without taking advantage of setting expansion.

(*b*) Another pattern will be invested utilizing the setting and thermal expansion of investments.

(*c*) Another pattern will be invested in the same manner as *b* except that wax expansion is utilized too.

1. Direct method used.
2. Peck's blue wax.
   Wax expansion, temperature of water bath 108 F.
   Time in bath, 30 minutes.
   Probable expansion, 0.35 per cent.
3. Coe universal investment, water 40 c.c., investment 100 gm.
   Room temperature water used in investment mix; hand spatulated.
   Time of set of investment, 15 minutes.
   Setting expansion, 0.25 per cent.
   Size of crucible rings: length 38 mm., diameter 28 mm.
4. Elimination.
   Time started after investing, 30 minutes.
   Entire heating time, 30 minutes.
   Maximum temperature, 1300 F.
   Thermal expansion, 0.65 per cent.
   Total approximate expansion, 1.25 per cent.
5. Casting: Perfection centrifugal casting machine; gas and oxygen used as fuel.

PRACTICAL MANAGEMENT OF THE PHYSICAL PROPERTIES OF INLAY WAX

(Alden J. Bush, Frank C. Starr, Columbus, Ohio.)

Some practical laboratory experiments showing qualitatively:

(*a*) Expansion and contraction of different inlay waxes.

(*b*) Practical management of wax variables.

(*c*) Energy that wax is capable of exerting during expansion; a possible explanation of fins when certain technics are used.

(*d*) Dimensional changes resulting from wax expansion.

SOME RESULTS OF CASTING PROCESSES FOUNDED ON FUNDAMENTALLY SOUND DATA

(George L. Wood, Geneseo, Ill.)

Satisfactory castings without wax expansion; using a low plaster-high quartz investment, so mixed and heated as to obtain a high setting and thermal expansion.

1. Indirect method.
2. Peck's blue wax (no wax expansion).
3. Ransom and Randolph green investment:
   Room temperature water.
   Water 30 c.c., investment 100 gm.
   Mechanical spatulation, using Kerr or Whip-Mix spatulator and giving 25 revolutions of the handle.
   Investment vibrated to place; dry investment sprinkled on and vibrated until moisture appears on surface.
   Time of set, 15-18 minutes.
   Setting expansion, 0.42 per cent.
   Crucible ring, 1¼ by 1½ inches, lined with sheet asbestos.
4. Elimination:
   Time started after investing, 30 minutes.
   Low heat (about 400 F), 20 minutes, gradually raised to about 1300 F.
   Entire heating time, 1½ to 2 hours.
   Thermal expansion, 0.85 per cent.
   Total expansion, 1.27 per cent.
5. Casting: made by Perfection casting machine; gas and oxygen used as fuel.

UTILIZATION OF INVESTMENT EXPANSION IN CASTING

(H. J. Altfillisch, C. G. Sanner, Dubuque, Iowa)

(The contraction of gold in the inlay casting process, approximately 1.25 per cent, can be compensated for by wax and investment expansion or investment expansion alone, depending on the materials and technic used.)

Direct method.
Taggart's wax and Peck's blue wax.
Wax expansion with Ransom and Randolph gray investment. No wax expansion with Ransom and Randolph green investment.
Temperature of bath, 115 F.
Time in bath, 25-30 minutes.
Hand spatulated.
Time of set, R & R green, 15-18 minutes.
R & R gray, 14-16 minutes.
Setting expansion:
R & R green, 0.42 per cent.
R & R gray, 0.45 per cent.
Size of crucible ring 1½ by 1⅝ inches, lined with sheet asbestos.
Elimination:
Time started after investing, about 30 minutes.
Entire heating time, 1 hour.
Maximum temperature, about 1300 F.
Thermal expansion:
R & R green, 0.90 per cent.
R & R gray, 0.85 per cent.
Total expansion, green, 1.32, gray, 1.30 per cent.
Casting: Perfection centrifugal casting machine and asbestos pad; fuel, gas and air, also "prestolite."

ACCURATE FITTING CASTINGS WITHOUT WAX EXPANSION

(Robert E. Blackwell, L. D. Sayre, Clarence H. Burr, Chicago, Ill.)

(Accurate fitting inlays can be obtained by the application of scientific data on the physical properties of investment materials in the inlay casting technics.)

1. Direct method.
2. Peck's blue inlay wax (no wax expansion).
3. Ransom & Randolph green investment, water 30 c.c., investment 100 gm.
   Coe universal investment, water 25 c.c., investment 100 gm.
   Mixing water at room temperature.
   Kerr's mechanical mixer, 100 turns of handle.
   Setting expansion:
   R & R green, 0.42 per cent.
   Coe universal, 0.35 per cent.
   Ring size 1 by 1½ inches, lined with sheet asbestos.
4. Elimination: Start 30 minutes after investing; entire heating time about 40 minutes.
   Maximum temperature about 1300 F.
   Thermal expansion:
   R & R green, 0.85 per cent.
   Coe universal, 0.92 per cent.
   Total expansion, 1.27, 1.27 per cent, respectively.
5. Castings made with centrifugal machine; oxygen and illuminating gas used as fuel.

THE EFFECT OF THE WATER-INVESTMENT RATIO ON SIZE OF CASTINGS

(Edouard M. Hall, Kansas City, Mo.)

(Varying the consistency of the mix has a pronounced effect on the size of the casting. The more water used in the investment mix, the less the setting and thermal expansion of the investment.)

Three castings were made using the same investment (20 per cent plaster of Paris, 80 per cent quartz) but varying the water-investment ratio as follows:

1. Water 50 c.c., investment 100 gm.
   Setting expansion, 0.25 per cent.
   Thermal expansion, 700 C. (1292 F.), 0.53 per cent.
   Total expansion, 0.78 per cent.
2. Water 40 c.c., investment 100 gm.
   Setting expansion, 0.31 per cent.
   Thermal expansion, 700 C. (1292 F.), 0.70 per cent.
   Total expansion, 1.01 per cent.
3. Water 30 c.c., investment 100 gm.
   Setting expansion, 0.42 per cent.
   Thermal expansion, 0.90 per cent.
   Total expansion, 1.32 per cent.

Patterns treated exactly alike except abovementioned mixes used.

A CASTING DEMONSTRATION

(Complete from the forming of the pattern to the finished casting)

(Woodbury Study Club and Southwestern Iowa District Inlay Study Club*)

Demonstration that castings can be made to dimension and that undersize and oversize castings can be made at will; also, relationship of indirect to direct method of obtaining wax patterns. (The setting and thermal expansion of the investment and the thermal

*C. E. Woodbury, Council Bluffs, Iowa; H. A. Merchant, Omaha Nebr.; C. H. Stewart, Farragut, Iowa; H. T. Dearborn and Max E. Brown, Red Oak, Iowa; C. W. Steward, Bedford, Iowa; F. M. Kelsey and H. W. Sidwell, Villisca, Iowa; T. I. Beckwith and D. W. Ireland, Corning, Iowa; J. H. Bang and H. D. Coy, Hamburg, Iowa.

expansion of the inlay wax, controlled by a water bath, will be utilized, but most of the castings are without the benefit of the water bath.)

1. Direct and indirect methods.
2. Peck's blue wax:
   Wax expansion: temperature in bath will vary according to room temperature and whether indirect or direct method is used.
   Time in bath, 20 minutes; probable expansion will vary according to degree range.
3. Ransom and Randolph green investment:
   Room temperature water used in investment mix.
   Water 32 c.c., investment 100 gm.
   First spatulated by hand, then by a mechanical mixer such as Whip-Mix or Kerr, 100 turns of the handle in about 30 seconds.
   Time of set of investment, 12 minutes.
   Setting expansion, 0.36 per cent.
   Small ring lined with asbestos.
4. Elimination:
   Time started after investing, 25 minutes; 15 minutes at about 500 F., 15 minutes at about 900 F., then to red heat, about 1300 F.
   Entire heating time, 45 minutes.
   Thermal expansion, 0.87 per cent.
   Probable expansion, 1.23 per cent.
5. Casting: any standard casting machine used.
   Heat gold until fluid but not to white heat.

The members of the profession who cooperated in this work are insisting that the materials which they use from now on must either comply with specifications or have their properties given. With such material, they develop their own technic and are themselves masters of instead of imitators of a technic.

Tentative specifications have been completed for inlay casting golds,[4] inlay casting waxes[5] and inlay casting investments.[6] These are the first standards available for this type of material, and to be made effective they must have cooperation and support. They were designed to insure that the dentist shall be able to purchase materials of known quality. Will we utilize them? If we insist on having materials which will pass the specifications, the demands for products will be shifted, the satisfactory articles will come to the front and stay there and the inferior ones will be improved or will disappear. There are several alternatives: One can base his selection of materials upon advertising as it is, on trade names, on testimony of paid or clever clinicians or upon the merit of the product as evidenced by its physical properties.

Such packages of the following materials as were tested during the first half of the year 1930 were found to meet the American Dental Association's tentative specification No. 2 for inlay casting investments[6]:

Alva inlay investment compound.

Cristobalite investment (not available commercially).

Kerr No. 3 investment.

Dr. Meyer's outer investment.

Pryomold No. 1.

Pryomold No. 2.

Ransom and Randolph green investment.

Whip-Mix inlay investment.[6]

Manufacturers of dental inlay casting investments were asked to certify that their products would pass the A. D. A. tentative specification No. 2. To date, the following have been certified:

Coe inlay investment.

Coe universal investment.

4. Taylor, N. O.; Paffenbarger, G C., and Sweeney, W. T.: Inlay Casting Golds: Physical Properties and Specifications, J. A. D. A., 19:36 (Jan.) 1932.

5. Taylor, N. O.; Paffenbarger, G. C., and Sweeney, W. T.: Specification for Inlay Casting Wax, J. A. D. A., 18:40 (Jan.) 1931.

6. Taylor, N. O.; Paffenbarger, G. C., and Sweeney, W. T.: Dental Inlay Casting Investments: Physical Properties and a Specification, J. A. D. A., 17:2266 (Dec.) 1930.

Kerr No. 3.
Ransom and Randolph green.
Ransom and Randolph gray.

Such packages of the following materials as were tested during the first half of the year 1930 were found to meet the American Dental Association's tentative specification No. 4 for inlay casting wax[5]:

Dr. Peck's blue inlay wax.
Dr. Peck's purple inlay wax.
Taggart's green inlay wax.

Manufacturers of inlay casting waxes were asked to certify that their products would pass the A. D. A. tentative specification No. 4. To date, the following have been certified:

Brewster inlay wax.
Maves No. 1 inlay wax.

INSTRUCTIONS FOR THE EDENTULOUS PATIENT*

By B. L. HOOPER, D.D.S., Lincoln, Nebr.

WE have heard much recently about "Dental Education for the Laity." Many articles have been issued concerning the natural teeth, their care and their relation to systemic conditions. Lectures have been given to civic clubs, and public clinics and demonstrations have been held frequently. Series of articles have been prepared by authorities and published in newspapers and periodicals; and the radio has proved a great aid in disseminating dental education to the laity.

The good that has come from this spreading of dental information, both to the public and to the profession, is untold; still there is much to be done.

Most of the dental information that has received publicity has referred to diet, the deciduous teeth, the care of the permanent teeth and the relation of focal infection to systemic disturbances, with now and then a word or two of warning about "false teeth."

Since almost every person must, at some time, face the fact that one or two and finally all of his teeth have failed to function normally and so must be removed, information for the laity regarding dentures is as important as information about the natural teeth. Information on dentures should be broadcast just as widely, and should be given publicity through every available avenue. It should not be meted out only to the person just entering on his experience with dentures, and withheld from the general public as though it were a subject to be mentioned in the dental office only.

An effort should be made to educate people in general about dentures, as to the advantages of obtaining records of the natural teeth and the facial expression before the teeth are extracted, the reasons for the surgical removal of the natural teeth and the necessity for accurate and careful construction of the dentures to harmonize with the movements of the mandible, as well as the use and care of the dentures.

When such knowledge becomes general among the rank and file of the people, much of the now prevalent horror of "false teeth" will have been eliminated.

*Read before the Section on Full Denture Prosthesis of the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

And those persons just about to lose the natural teeth, as well as those who are just beginning to learn to wear artificial dentures, will perhaps be spared many unkind remarks from family or friends ignorant of the details of the case. Would not this be a great help to the dentist in many instances? It certainly would greatly improve the mental attitude of the denture patient to receive intelligent and encouraging comment from his associates.

Information regarding dentures when properly presented to the laity is mutually beneficial, and is deserving of serious consideration from the profession. Every dentist is in position to aid in this service, and thus help himself, his fellow dentists, his patients and humanity in general.

It is quite generally conceded in the profession that cooperation from patients plays an important part in successful denture service.

Cooperation has been defined as complete understanding put into action. Assuming that the dentist has complete understanding and that he sincerely puts forth every effort to give his denture patient a satisfactory denture, cooperation is not complete unless the patient too has a complete understanding of the problem confronting him and his dentist, so that he too may put forth every effort for a satisfactory end-result.

He and the dentist must work together for a common cause. If he does not possess sufficient understanding or knowledge (and most patients do not), the dentist is not cooperating fully unless he provides the information the patient lacks or needs.

To become proficient in any line of endeavor calls for the observance of all details, even the minutest, which enter into the process of accomplishment.

There are many instances in which the dental profession has become so absorbed in certain phases of dentistry that other things of importance have been lost sight of.

Although denture work is one of the most fascinating and interesting subjects in dentistry, the work is of such nature that many dentists have acquired more or less of an inferiority complex regarding it, with the result that, in their effort to perfect themselves, they are prone to center their thoughts on what appears to be the most important steps of the work, and they fail to observe other factors which may affect the end-results, assuring success or failure.

For instance, the tendency is to perfect one's self in such steps as impression taking, jaw relations, alinement of teeth, etc., giving little consideration to other steps, such as advice and instructions for the edentulous patient.

Considering the case in hand, the construction, use and care given the dentures are the determining factors of its success, each playing an important part.

It then behooves the profession to give some serious thought to the subject of instructions for the edentulous patient, as otherwise a well-constructed denture may fail, owing to the lack of proper instruction from the dentist, and failure on the part of the patient to use and care for the dentures properly.

As we survey this subject of instructions for the edentulous patient, some questions arise in our minds. For instance, what advice and instructions should be given? Will the same instructions fit all cases? Should they be given orally or in printed form? Is it wise to recite all the ills experienced in wearing new dentures? Is the tone of our advice and instruction to be pessimistic, or are we to give a brighter and more optimistic view of the subject? These are all im-

portant questions both to the dentist and to the patient.

The ever-present psychologic element must be regarded, and we must realize that we are building up a mental attitude which may foster success or one which portends failure.

Before discussing the questions previously asked, let us consider the dentist. First, is he really interested in rendering high grade, conscientious denture service? Is his experience sufficient and are his observations accurate enough that he is qualified to give applicable instructions?

To the degree that one is willing to spend the time and thought necessary to produce a high-grade piece of work will he be successful in planning and building well-made dentures. If one's experience and observation are such that earnest, sympathetic advice and instruction can be given, the success of the well-made denture becomes more of a reality. If one does not possess sufficient experience and his observation is limited, he must depend on the experience of others. This is made possible by the printed booklet.

For the sake of convenience, let us divide the patients who are to receive instruction into three classes on the basis of their knowledge of dentistry and their general intelligence, class A being the intelligent, class B, the average and class C, the patient of low intelligence.

A class A patient will grasp ideas readily and his common sense and judgment dictate certain requirements of his social position. He does not require a detailed explanation as to why dentures should be kept clean; he is interested in knowing the most efficient means of keeping them clean. While he is interested in obtaining a high degree of efficiency from his dentures, it is unnecessary to give him a complete explanation as to why artificial dentures will not function as well as natural ones. Such explanation might only bore him. He is concerned about his facial expression and his ability to speak well, as these are two valuable assets in his social position. When a keen interest in any one feature of his dentures is shown, an intelligent and concise explanation should be given him.

A satisfactory denture service can be rendered to the class A patient far more easily than to any other class. He realizes that all patients cannot wear dentures with the same degree of comfort and success. He has selected you as his dentist with the same judgment that he has used in other matters. Therefore, he places confidence in you. For this reason, it is better to give instructions to the class A patient orally. He realizes that his case, while similar in many ways to other cases, will vary from the general and therefore requires some special consideration, advice or instruction.

While a few of the outstanding features in the initiation of the apprentice denture wearer may wisely be mentioned, they need not be enlarged on. A rather optimistic tone should be adopted in giving advice and instructions to this patient.

The class B patient will require more instruction and more explanation. It is well not only to detail the means of cleaning artificial dentures; but also to explain how deposits gather and their effect on the sanitation and health of the mouth.

This patient will require the reasons that artificial dentures will not function so efficiently as the natural teeth. He will need a more specific outline as to how to eat, what foods to select and how to overcome interference in speech. As he does not possess so broad a knowledge as the class A patient, nor is his intuition

so keen, it is well to describe to him in detail the possibilities and probabilities of denture wearing, giving the reasons that certain conditions exist and informing him as to what improvement he may expect after learning to wear and use the dentures.

The class B patient will be more apt to take the advice of his neighbor and to discount the dentist's instructions. It is therefore advisable to support all important statements by giving him the reason. This will impress him with its value and he will remember it.

A class B patient, as compared to a class A patient, does not make such definite decisions; and there may be some doubt in his mind as to whether he made the right decision in selecting a dentist to care for his case. In other words, his confidence in you may waver. If your advice and instruction to this patient is not convincing, he will be certain that he made the wrong decision. If he arrives at that point, it will be most difficult to render him a satisfactory service.

If one will take the time and pains to explain clearly the whys and wherefores of the drawbacks and of the advantages of artificial dentures, there need be no difficulty in satisfying and making the class B patient happy with his new dentures.

The class C patient presents the greatest problem, being more apt to expect the impossible. If the dentures do not come up to his expectation, he will probably wear them periodically. Even his sense of pride does not demand the tolerance necessary to pass through the first few days with the new dentures.

This type of patient requires somewhat of a challenge to wear new dentures. He must know the disagreeable side of the use of dentures, and a careful explanation must be made as to how he may overcome the obstacles as other patients have overcome them. Sanitation and mouth hygiene must be carefully explained, and the prognosis in case of neglect must be impressed on his mind.

It will take all the ingenuity of the dentist to give this patient advice and instruction that will foster his cooperation. Well-presented oral instruction, along with a printed booklet, will be of valuable assistance in impressing this class.

There are other types of patients who require special consideration, regardless of whether they fall into class A, B or C.

There is the patient who is in ill-health or who is in rather discouraging circumstances. Certainly, this patient needs no additional discouragement, and therefore it is wise to say little or nothing about the disagreeable phases of denture wearing. Follow the old adage, "Do not cross the bridge before you come to it." If the patient brings up some of the ills of denture wearing, simply admit their existence, but give him some hope and assurance that he may escape some of the troubles usually attendant, or at least that there will be a way out, and that he will be happy with the dentures. Keep the thought of a bright future before him, even though both he and the dentist may be passing through some dark moments.

The nervous patient who expects and insists on rapid action must be advised of the fact that it requires time to become accustomed to dentures, and that Nature must adapt herself to the new conditions, and one must be patient until such adjustments take place.

The arrogant patient or the patient who feels that he possesses exceptional ability must be handled with rather a stern hand. He is apt to indicate that your advice and instruction is super-

fluous—that he knows what to expect and what to do. It is well to cover all the details of instruction, regardless of his attitude; and while he may appear to be bored, he is at the same time absorbing much good advice. Of course, he will never admit the fact, but he was probably totally ignorant of many things that he should know.

Young patients need not be impressed with all the woes of denture wearing. They meet situations easily and adapt themselves quickly. However, they are busy, and often pass hurriedly over such items as mouth hygiene. For this reason, one must emphasize the necessity for proper care of the dentures.

Elderly people require a more sympathetic type of advice and instruction. One should take the time to explain how the uncomfortable experiences of denture wearing may be overcome. A careful explanation of the care of dentures will be necessary; and special emphasis should be made if the patient seems prone to neglect this duty.

The dentist, in giving advice and instruction, must be resourceful and tactful. He must make his ideas and advice fit each and every case. There are, of course, general instructions which are applicable to the average case, and it is only necessary to seek out those cases which require a deviation from the routine.

To the man in general practice, who must of necessity give considerable attention to other phases of dentistry, and whose chair time is filled, the printed instruction is a time saver. Also to the younger professional man, whose experience with denture patients and their peculiarities is somewhat limited, the booklet is an important aid.

There are several well-written articles and booklets which have been in use for educating the laymen concerning the wearing of dentures. Those who have been privileged to use such material endorse this means of instructing the patient.

I am aware of the danger of giving too much advice as tending to confuse the patient. If too gloomy a picture is painted by going into detail regarding all the disagreeable phases of denture wearing, the patient may become discouraged. However, enough advice and instruction must be given to aid the patient in this, his new experience with artificial dentures.

Following is my conception of the suggestions which should be included in such a booklet:

YOUR NEW TEETH

The success of artificial dentures depends largely on the use and care given them. The following suggestions are presented with the idea of giving advice which will aid in obtaining maximum comfort and the best service possible.

DETERIORATION OF NATURAL TEETH

Nature provides each individual with several important organs, each for a specific purpose, the eyes to see, the ears to hear, the heart for circulation, the stomach for its part in the process of digestion. Among the important organs of the body are the teeth, which prepare food for digestion and assimilation, aid in speech and help build facial expression and personality.

As the years go by, the various organs of the body, through use, disease, neglect and abuse, become impaired, and, in some instances, are totally lost. The eyes are dimmed, the hearing becomes indistinct, the fingers lose their deftness, and so, in the various parts of the body, we deteriorate.

The teeth are particularly susceptible to destruction, through wear, disease, abuse and neglect; and the result is that this important organ of expression, mastication, and speech is often lost early in life.

MODERN DENTISTRY

Fortunately, the art and science of dentistry has provided means by which the lost natural

teeth can be replaced with substitutes which simulate quite accurately the natural teeth in their various functions. These substitutes are properly called "artificial dentures."

NATURAL DENTURES

Nature provides two natural sets of teeth or dentures. The first set consists of twenty "baby" teeth or temporary teeth. The second set consists of thirty-two so-called "permanent" teeth.

It was Nature's plan that the temporary, or deciduous, teeth be lost to make room for the larger and stronger ones.

Nature intended that this second set should last throughout life; but owing to some of the conditions before mentioned, this most valuable organ may be lost; and dentistry is called on to substitute a third set—the artificial denture.

DISCOMFORT

It is singular to note that the advent of the baby teeth caused fretfulness and discomfort. Discomfort and pain also accompanied the eruption of the second, or so-called "permanent" teeth.

In natural sequence, then, a period of discomfort attends the initiation of the third set, or artificial teeth.

ENUNCIATION

A little difficulty in enunciation may be experienced, owing to the presence of foreign material in the mouth. A few hours' practice will acquaint one sufficiently with the denture that little trouble will be had in this respect.

Reading audibly, with attention centered on pronunciation rather than the subject material, is good practice to overcome any interference encountered in speaking.

FACIAL EXPRESSION

Facial expression may seem slightly altered at first; but, as the dentures are worn, and the muscles of expression in the cheeks and lips become adjusted so that they function normally, natural facial expression will be resumed.

MASTICATION

The most trying experience in the wearing of new dentures is eating. It is difficult to manipulate both teeth and food in the effort to chew. One must be patient and persistent. Select foods which require very little chewing. Foods the mastication of which requires considerable pressure should be avoided entirely for several days; and even after one becomes accustomed to the use of the teeth, care should be taken not to use the dentures too vigorously, because it may cause tissue destruction under the dentures.

Small bites masticated slowly will facilitate the use of artificial teeth. Food may pass under the dentures, which will give considerable discomfort; but as the dentures are worn, they become seated more securely, and this disagreeable feature will be improved.

In biting off a morsel of food, it is much better to press the food back against the teeth and, at the same time, break the food off with a twisting motion of the hand. This method will help hold the dentures in place and, at the same time, make the process of biting off food easier.

Infinite patience is required in learning to eat; and until one learns to manipulate the new teeth, and the gums and ridges have become toughened to pressure, one should not expect to eat anything and everything.

It takes several weeks for the gums and ridges to become hardened and toughened to their new task. If sore areas develop, an appointment should be arranged, when the dentist will adjust the dentures and give relief in these areas.

WEARING DENTURES DAY AND NIGHT

Unless the patient is otherwise directed, dentures may be worn at night. They must be carefully cleaned before retiring. If dentures are worn constantly, the face will hold its normal shape, and the dentures can be worn more comfortably.

If it seems necessary to remove the teeth to rest the mouth, rinse them in cold water, rinse the mouth in cold water or a cold mouth wash, and replace the dentures. If they are left out of the mouth, any irritated places on the ridges or tissues may swell, making it difficult or impossible to place the teeth back in the mouth.

Dentures should be kept moist. In case it becomes necessary to leave the dentures out of the mouth for some time, they should be placed in water, boracic acid solution or a mouthwash.

CARE OF DENTURES

Artificial dentures, like natural teeth, must be kept clean and free from deposits in order to preserve the health of the mouth. A brush made especially for artificial dentures may be procured at any drug store. The bristles of

these brushes are stiffer than those in the ordinary toothbrush.

Artificial dentures should be brushed with a cleansing agent, and rinsed in running water, and the mouth rinsed thoroughly on arising in the morning, after each meal and before retiring. Ordinary baking soda, cleansing powder or a paste prepared especially for dentures may be used for the cleansing agent. The denture should be thoroughly scrubbed and rinsed well before it is replaced in the mouth.

Tartar will gather on artificial teeth as on natural teeth. Periodic visits to the dentist for cleaning and polishing the dentures are as important as such care of natural teeth.

STERILIZING DENTURES

Never place dentures in hot water or pour hot water over them to sterilize them. After a thorough cleaning with a stiff bristled brush as before directed, dentures may be immersed in boracic acid solution or an antiseptic wash, being allowed to remain several minutes.

BREAKAGE AND REPAIR

Dentures should be handled carefully when out of the mouth. To drop them but a few inches into the wash bowl may mean the breaking of a porcelain tooth. Other accidents may mean greater damage. After any accident to the denture, do not continue to wear it, as it makes the repair more difficult and more costly.

A denture wearer may be saved much discomfort and embarrassment during the time his denture is being repaired if he is prepared for such emergency by having an extra or "spare" denture. One whose occupation takes him away from home and his dentist, or who must meet the public constantly, can ill afford to be without duplicate dentures. Especially when planning a trip abroad should this be taken care of, in order that traveling and visiting time may not be taken up with dental repairs.

LOOSENESS AND FACIAL WRINKLES

The ridges on which the dentures are supported are quite transitory. The shrinking away of this tissue produces two undesirable results. In a large percentage of cases, the ridges recede or shrink away, which causes the dentures to become loose and permits a change in the facial expression.

Sometimes, the shrinkage or recession is such that the dentures do not loosen, but the facial expression is altered because, as the shrinkage progresses, the jaws come closer together. This closing together of the jaws gives the denture wearer deep lines and wrinkles about the lower part of the face, which gives an aged appearance, and also impairs the function of mastication.

NEW BASES

When shrinkage of the ridges progresses to a place where the dentures are too loose to be worn, or the facial appearance becomes changed noticeably, the dentures should be rebased or duplicated or a new set may be necessary.

The duplicating or rebasing process is not considered a part of the original construction of the dentures, owing to the fact that shrinkage is such a variable factor. Dentures may require duplication in but a few weeks, or they may give service for a year or more with no additional service. When the dentures are duplicated, the original facial expression and the retention of the dentures are restored, as when first made.

It is impossible to determine how soon after the dentures are made that duplicating will be necessary, or how often it may be necessary thereafter in order to retain the normal facial expression. There are many conditions which influence the rapidity of the shrinkage, such as the health of the individual, the amount and virulence of the disease which existed about the natural teeth and the condition of the ridges after the natural teeth are removed. As time goes on, the ridges shrink less and less, so that periodic duplicating becomes less frequent.

DEPENDING ON DENTIST, NOT ON HEARSAY

The following conditions may be experienced in learning to wear new dentures; all of which will disappear as one becomes accustomed to the new teeth: a feeling of looseness, tipping of the dentures in chewing, increased flow of saliva, clinging and sticking of food to dentures, food passing under the dentures, slight crowding of the tongue or a feeling of bulk and a slight gagging sensation.

As no two persons encounter the same difficulties or experience the same satisfaction with dentures, advice from friends or relatives should not be regarded seriously. Your case is individual, and may be entirely different.

Your dentist is in position to advise you and his instructions should be followed.

There are many dentists who have made use of the printed booklet with all types of patients, and they express complete satisfaction with the results. It fills a need in our professional service; and if made up in an attractive form to harmonize in dignity with the office is a very desirable adjunct.

On the table in our reception room lies a scrap book which contains pertinent illustrations, short articles picked from magazines, literature concerning teeth and health and several booklets on denture information.

Booklets by Harry J. Horner, Victor H. Sears and H. O. Brown, and statements by George Wood Clapp and others are included. Patients reading these booklets are more willing and ready to accept some of my instructions once they have read similar suggestions from another dentist's pen.

Whether we give instruction orally or in printed form, it should be given tactfully and with a sincerity that impresses the patient. If the instructions and advice are incomplete or meaningless, and the patient is not impressed, the work may be a failure. It will be time and thought well spent for those who have not given this phase of denture service consideration to devote some energy to improving themselves in this respect.

It is only through the application of small details that we can perfect our professional services, that we can become successful in our chosen field, and that our patients may be happy, comfortable and healthy.

DISCUSSION

Harry J. Horner, Pittsburgh, Pa.: It was recognized in our office many years ago that we could not expect intelligent cooperation from our denture clientele if we did not take the time to acquaint the patient with his problem; and, as a result, a good deal of time is given to educating the edentulous patient, time which we consider well spent. Dr. Hooper says, "Denture information should be broadcast widely and given all possible publicity." The sooner the dental profession at large recognizes the truth and value of this statement, the better off we will be. Many dental specialists agree that the biggest single factor in the construction of dentures is maintaining or restoring the facial expression and having the dentures look natural. Preextraction records are a great help in the construction of dentures and certainly eliminate a great deal of guesswork. Dr. Hooper says, "The tendency is to perfect one's self in such steps as impression taking, establishing jaw relations, alinement of teeth, etc., and give little attention to other steps, such as giving advice and instruction to the edentulous patient." The days when denture patients were told to "wear these teeth if they kill you," are, I hope, past, and the dental profession is realizing more and more how necessary it is to give the patients all possible information about the service that we are trying to render. Dr. Hooper suggests that we divide our patients into three classes, A, B and C. He did not mention two general classes, which I feel sure he will agree should be included. I refer to the patient who for the first time is beginning to wear dentures and the experienced denture patient. Different instructions are given to the beginner from those given the patient who has worn dentures for years. I am not at all sure that I am competent to make the mental classification that Dr. Hooper has made as I have sometimes found that patients who seem to be very intelligent turn out to be very dumb. In order to protect myself, I make it a rule to give a book on denture information to every denture patient, and we find many times, on subsequent inquiry, that they have never read the booklet. A prominent specialist in denture work has said that he thinks it would be a good idea to have the patient sign an agreement to read the booklet and then later check up to see whether he really has read it. The fact of the matter is that many very intelligent denture patients are not in a sufficiently receptive or retentive frame of mind to remember oral instructions, and we, therefore, feel safer in giving them the printed word. Many of our patients have passed through the hands of medical men before we finally see them, and with the illness

and various tribulations that they have been through, they are not mentally fit to remember, and it is quite a satisfaction to tell them that the questions they are asking are all answered in the book of information given them. If it were possible for the American Dental Association to put its stamp of approval on one of the denture information booklets that are already being used or to appoint a committee to formulate the subject matter of a booklet which would meet the approval of the Association, it could be used by the dental profession at large and would be of incalculable benefit as it would be recognized as authoritative. We should not indulge in too much pessimism in educating our denture patients, but we would better be pessimistic than to be too optimistic, building a picture of perfect success, and then having a disappointed patient. If there is any field of dentistry where high pressure salesmanship is contraindicated, it is the denture field. It is always wise to tell denture patients the exact truth, never misleading them. Let them have the best possible understanding and when they seem to be discouraged, keep up their morale and tell them they are really doing better than you thought they would. If it should happen that the denture patient develops a very antagonistic attitude and seems to doubt your sincerity and earnestness, it is sometimes wise to give up the case. It is our practice in educating the denture patient to show them models illustrating what we are trying to tell them. For instance, if we wish to make some irregularities in the set up of the teeth, we show them a denture with the teeth arranged irregularly. If we wish to use different colors or hues in the teeth, we show a denture that has been made in that manner. Patients will sometimes say, a day or two after receiving their denture, "Doctor, I cannot eat with these teeth." They do not seem to do their own thinking and seem to have but little ability to reason regarding their problem; but if we show them a glass eye, and explain to them that artificial teeth and glass eyes are in the same class, i.e., a man made substitute for a natural organ which has been lost, they realize that it is not reasonable to expect the same degree of function that the natural organ gave them. We tell them at the same time that, by actual scientific test, the amount of biting or crushing pressure that it is possible to exert with dentures is but a small percentage of the amount of pressure possible with natural teeth which are set in the jaw bones. It is well to watch carefully the patient who says, "Doctor, I am going to leave it all to you." Our usual reply to a patient who says that is that while we are willing to be responsible for the mechanical part of the work and of course will use the best materials in making the dentures, we want patients to help decide the important factor of how they look, and, more than that, we invite them to bring a critical member of the family or a critical friend with them at the time we are trying the denture in. Then if we are unable to satisfy them as to the appearance of the dentures, we let them come in for another trying in or we discontinue the case at that point. Dr. Hooper is right in saying that young persons quickly adapt themselves and older ones require much more time. The health of a patient is very important as a patient in good health will progress more rapidly than one in poor health.

George Wood Clapp, New York City: In order that we may form an opinion of the value of the paper to which we have just listened, let us try to get a bird's-eye picture of the conditions in the profession to which the paper is addressed. Dr. Hooper was assigned this subject. He has delivered his paper before an unusually intelligent audience gathered from all parts of the country. It will be printed in a magazine of world-wide circulation. As I read it when it was sent and have heard it today, I have wondered just how much value it would have outside this room. In trying to determine that value, let us keep in mind that the suggestions are for edentulous patients and therefore apply only to full dentures on both maxillae. I know something about Dr. Hooper's work. It is such as any dentist might be both happy and proud to be able to do and as any patient is fortunate to get. I feel sure that for him and his patients the suggestions which he has made are excellent. But not many of us are Hoopers. Outside his office, there are 65,000 other dentists the majority of whom will make dentures at least while the depression lasts. What practical value will these suggestions have in their hands and for their patients? That is the question to which I propose to address this discussion. In order to answer the question as to the practical value of these suggestions to most of the dentists who make dentures, I sought information about those dentists and the dentures they make—not how they talk

(I've known that for years), but how they work. I wanted to get outside my personal acquaintance. I didn't want to know about any dentist by name, only about a lot of them collectively, so I went to the laboratories. That is the place to find out, if they dare tell you. In order not to be partial, I took two cities in which the laboratories serve at least 5,000 dentists, but the results were so nearly alike that I might just as well have stayed in one city. There is reason to believe that in these cities about 90 per cent of the full dentures are made by industrial laboratories, that is, by other than technicians employed in an individual dentist's office. There are denture specialists in both cities, some of whom do beautiful work and who either have their own technicians or have special arrangements with a laboratory that they have found to be competent. But all such dentists are believed to account for less than 10 per cent of the dentures made in these two cities. Let us leave them out of the discussion and see on what quality of service suggestions for 90 per cent of edentulous patients are to be based. Let us begin with impression-taking, admittedly one of the most important steps in denture construction. Largely as the result of insistence by the laboratories, and even more largely as the result of postgraduate instruction from sources other than professional, about 20 per cent of the dentists in these cities are able to take good impressions. The others persist in taking open-mouth plaster impressions, which do not show that the dentist has any conception of what muscle-trimming is or of its importance. About one impression in every twenty-five is so bad that even a laboratory cannot accept it. Probably not more than one set of full dentures in every four starts out with even fairly good prospects of success. The next important step in denture construction is taking the bite. I use that term because it can be made to cover two distinct but interrelated activities, reestablishing the length of face that will give the best esthetic result and securing and recording centric relation. Let us take first the matter of the length of face. So many dentists persist in making mash bites that the laboratories in these cities have been compelled to adopt the following plan. They urge dentists to send them the impressions. Into those impressions, the laboratory pours stone casts, upon which it later makes shellac base-plates and wax occlusion rims. It returns these to the dentist with instructions to get the correct total height of the dentures and, if the dentist can do so, the relative vertical height of the upper and lower rims. Also, the dentist is required to mark the median line, the corners of the mouth and the high lip-line. Many dentists who are frequently netting more per hour from prosthetic work than from any other form of their practice say they have not the time to build occlusion rims and take bites. The facts are that most of them do not know what to do or how to do it. The struggles of a large percentage of the dentists in these simple operations would be ludicrous if they were not pitiful in men having professional degrees. Few can trim a maxillary bite rim to a length of which they are confident and fewer of them will set the upper anterior teeth, even when the teeth have been sent by the laboratory, to see how they look in the mouth. When the laboratory has set the teeth in the wax rims, these dentists seem to be unable to correct the position as they want them. Frequently, two trials by the laboratory are necessary, and often three. These dentists are generally unconscious of the opportunities for esthetics. Only when the dentures have been completed and vulcanized and prove unsatisfactory in esthetic results does it seem to occur to them that they might have carved the bite rims labially to give pleasing positions of the lips. Therefore, much has to be done over that should have been done in the first place. The step in full denture construction next in importance is to secure correct centric relation. This is first of all a jaw relation and secondarily a tooth relation. If guesswork and blundering have occurred in the earlier stages of the work, they run riot here. Apparently not over 3 or 4 per cent of these 5,000 dentists use gothic arch tracings. The others use every form of device and guesswork that can occur to them and some that should never occur to anybody. As a result, when full upper and lower dentures are to be made, many of these dentists do not dare to have the two made at once, but have the upper denture made first and, when that is in position, make the lower in relation to it. Such procedure has one or both of two unavoidable results: by increasing the cost it unnecessarily raises the fee or it unnecessarily lowers the profit in that fee. It is now more than thirty years since I stood one day in a dental laboratory at Toledo, Ohio, and saw a box opened which contained these instructions:

"Use these impressions and this bite, and make me a pair of plates for a fat woman, 45 years of age." I hoped that specifications like these had ceased to be the order of the day, but they have not. It is now more than twenty-five years since Dr. Berry, of Milwaukee, gave us a simple and practical method of selecting forms of anterior teeth that would harmonize with the form of the face. It is seventeen years since Dr. Williams gave us teeth that made these rules practicable. During those years, enough has been said and written on the relation of face form and tooth form to convert a nation. But not more than one dentist in ten of those who patronize the laboratories where I made inquiries specifies the molds of anterior teeth. They still want dentures for a woman of fair complexion, for one who is short and stocky, for one who is 50 years of age or for a big man with a heavy moustache. Is it any wonder that the first requirement for being a good laboratory technician is that a man shall be a mind-reader? Just one more illustration: Every patient who has lost his natural teeth a few at a time over a long period of years has suffered derangement of symmetrical movements of the mandible, so that, when masticating on one side, the mandible moves differently from the way it moves when masticating on the other side. No middle-aged patient is likely to have new and efficient mandibular movements thrust on him by artificial dentures. It is therefore well worth while, from every point of view, to have the dentures conform to the habitual masticatory movements. But this cannot be done unless these movements are recorded and reproduced with at least approximate accuracy. Less than 5 per cent of these 5,000 dentists seem to have any practical conception of the importance of this. It is therefore impossible for them or anybody else to arrange the teeth knowingly to conform to such aberrations of movement as the patient may exhibit. This failure on the part of the dentist means that the patient's masticatory movements will probably be new in character and perhaps very limited in range—frequently only an up-and-down movement—and that the dentures will frequently knock each other out of position unless the masticating efficiency of the teeth is destroyed by extensive grinding. I happen to know that Dr. Hooper takes good impressions and bites, that he records and reproduces individual mandibular movements, that he selects anterior teeth to harmonize with the form of the patient's face in repose and that he arranges teeth so that each patient may keep, as nearly as possible, his individual mandibular movements. And so people go from New York to a town nobody in the East ever heard of until Bryan nailed it to his cross of gold with a free silver spike, and pay, to one of the most modest of men, fees that would, today at least, turn half the dentists in New York green with envy. And from him to these patients these suggestions are excellent. But suppose that when his article is printed, it should come to the attention of these 5,000 dentists about whom I have been talking. (It will not, because a lot of them threw away their books when they got their diplomas and said, "Thank God, that is over!" and the only place for dental magazines in their offices is on the reception-room table, where patients can see that the dentist takes them.) Then, suppose another miracle—that these 5,000 men took these suggestions to heart and made them to patients. What *can* you say to a patient whose dentures have been made over poor impressions, with worse bites and with no knowledge of face forms or jaw movements? Of course, the proper thing to have said in the first place was to go somewhere else and have the dentures made, but that almost never happens. So these things are relative. If you are a follower of the same principles and practices as Dr. Hooper, say what he says. But if you are No. 5,001 in the group I have used as a check, do not be surprised if your patients say to you what too many of mine used to say to me thirty years ago, "Doctor, these teeth are all right except when I eat." It will take radically different suggestions to talk them out of *that* notion.

Dr. Hooper: Dr. Clapp has touched a very vital spot in his discussion. Unless dentures are constructed to meet the rigid requirements of present-day advanced knowledge, it will surely be difficult to give advice of this character. Dr. Clapp's comments should stir the profession up to a point where we will become more earnest about our work and produce dentures of which we can justly be proud and which make the patient happy. I am glad that Dr. Horner stressed the use of preextraction records. These are of inestimable value, both to the dentist and to the patient. Dr. Horner's suggestion of classifying the patients into edentulous and dentulous meets with my approval. My idea in the suggested booklet was

to advise the patient lacking in experience with dentures; and I feel that it would then be adequate for both classifications. Dr. Horner has suggested ideas which add value to this subject of advising the edentulous patient. The nature of prosthetic dentistry is such that there is opportunity for us to give vent to our artistic, mechanical and scientific tendencies. After producing a piece of work, we do not wish to stand by and see it fail, owing to misuse or lack of care on the part of the patient. It therefore behooves us to give consideration to this important subject, instructions for the edentulous patient.

THE PLACE OF ULTRAVIOLET RAY IN THE TREATMENT OF PERIODONTOCLASIA*

By A. T. RASMUSSEN, D.D.S., F.A.S.S., La Crosse, Wis.

IT would seem that no argument is necessary to prove that ultraviolet ray therapy has a place in the treatment of oral diseases. This form of energy, namely, the ultraviolet rays of the electromagnetic spectrum, has been accepted by the scientific and medical world as a potent remedy in the treatment of certain types of disease to which the human body is subject.

The oral cavity, with all of the organs contained therein or associated therewith, is an integral part of the whole organism and therefore will be affected by the same pathologic disturbances and the same remedial measures as are all other parts. That being true, it remains to determine the fundamental nature of the diseases manifesting themselves in the mouth, and having done so, to make proper application of present-day knowledge concerning remedial agents. This I shall attempt to do in this study.

Unfortunately, in dental literature, we find little distinction made between periodontal disease that is the direct result of local conditions, and disease of a systemic nature, the most prominent symptom of which may be in the mouth.

Anyone observing enough to note the facts in the case has seen many patients suffering from periodontoclasia, pyorrhea alveolaris or what-have-you, all of which was the direct result of irritation to the periodontium and the alveolar process from accumulations of calculus, overhanging or porly contoured fillings in teeth or poorly fitted crowns and badly designed bridges; veritable monstrosities, more or less completely obliterating interproximal spaces and impinging on the periodontium and the alveolar bones.

Add to this the resultant food impaction and inability to keep the teeth clean and there is established a condition in which the structures are traumatized and in a constant state of inflammation owing to persistent irritation. Such a condition is an open invitation to infection with pyogenic micro-organisms, and that usually occurs.

In its effort to get away from an irritant, Nature proceeds to break down the periodontium and the alveolar process. Thus, with the ever-present pyogenic infection, there is established a suppurative periodontoclasia, distinct from peri-

*Read before the Section on Periodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

odontoclasia resulting from other causes and in which there are no traumatized structures or suppuration. In other words, such cases present a picture of the periodontal structures breaking down, owing to trauma and persistent irritation, complicated by suppuration.

RESULT OF PRESENCE OF TOXINS

As a result of the infection, the entire system is suffering. Nature's defenses are called on to combat the toxins absorbed into the circulation, and gradually the general resistence is lowered. The metabolic processes are disturbed; the alkaline balance is lowered, and a general acidosis prevails. There is probably more or less disturbance of the endocrine system also as a result of the long continued drain on the vitality.

While ultraviolet ray treatment is of value in such cases, it is self-evident that permanent improvement cannot be expected until the cause of the disturbance is removed; that is, all overhanging and poorly contoured fillings, crowns, bridges, etc., are removed and replaced with restorations that really restore. Calcic deposits that are acting as irritants must be removed.

When I speak of tooth restorations that really restore, I mean to convey the thought that any restoration, whether a simple filling or a complete artificial crown, must restore the natural organ in all of its detail. Just as far as it fails to do this, the operation is a failure.

Extensive pockets about or between the teeth, the result of absorption of the periodontal structures, must be surgically eliminated in order to secure anything like permanent results of treatment, for bone and periodontium that have been completely destroyed will not be replaced through any treatment with which I am familiar.

Once the physiologic union between the periodontium and the substantia ossea, or cementum, is pathologically destroyed, little or no reattachment occurs.

Under such surgical procedures, recovery ensues in most of these cases provided the supporting structures of the teeth have not been too greatly weakened. In those cases in which the teeth have been badly loosened and the whole system is seriously disturbed, ultraviolet ray treatment is used to advantage, locally for the stimulating effect, and in general body irradiations for the effect on the mineral metabolism, and, in turn, the correction of acidosis.

ANTIBACTERIAL EFFECTS

The question might be raised as to the value of ultraviolet rays in destroying the infecting micro-organisms; in other words, using the rays for their bactericidal effect.

In my experience, the pus in these cases is not the difficult factor. With proper drainage and removal of irritants, Nature's defenses usually take care of that. However, the question of ultraviolet rays and their germicidal effect is a legitimate one.

While it is true that ultraviolet rays are highly bactericidal to organisms coming in optical contact, it is also true that the rays penetrate the mucous membrane but very slightly.

They do not penetrate even the thinnest layer or film of blood. Saliva and mucus also absorb the ultraviolet rays of the shorter wave lengths completely. It follows, therefore, that the task of keeping the field clear of saliva and blood, and the very slight penetrating power of the rays, even under pressure, make it exceedingly difficult to get the rays into optical contact with any but surface bacteria. Hence, the bactericidal value of

ultraviolet rays is in such cases somewhat questionable.

It is my opinion that only surface bacteria will be destroyed by the rays directly, and while this may be of some value in reducing the number of bacteria present, I do not place so much value on that as on the hyperemia which follows as an effect of those rays of longer wave length that do penetrate sufficiently to so affect the structures.

The longer ultraviolet rays (those lying between 4000 and 3200 A°), and possibly some of the visible rays, may be important factors in bringing about some of the deeper reactions to local treatment. There is some evidence to substantiate such a belief.

The hyperemia, in addition to the increased oxygen-carrying capacity of the blood, and the increased leukocytic activity which follows general body irradiation, is, I believe, of sufficient importance to lead us to regard the ultraviolet rays as a valuable adjunct in the treatment of this type of disease. The technic of treatment I shall speak of later.

OSTEOMALACIA

Nonsuppurative periodontoclasia presents quite a different clinical picture. Unfortunately, this condition is not nearly so generally recognized, nor does it yield so readily to treatment. In this condition, there is a progressive destruction of the alveolar process and other structures overlying the roots of the teeth, with no visible irritants nor indications of pyogenic infection.

Frequently, patients suffering from this form of periodontoclasia have given the mouth meticulous care, but in spite of such care, there is a gradual recession of the gums, exposing the tooth roots until the teeth themselves are loosened and lost. Even, then, the process continues until, in some cases, the entire alveolar ridge is absorbed. Even before any marked recession of the gums has occurred, roentgenographic examination may reveal rarefaction of the alveolar process so extensive as to indicate its complete destruction, and yet the physiologic attachment of the periodontium to the cementum remains to a line very close to the edge of the gum.

The careful observer has often seen teeth that were markedly loosened and yet the periodontal attachment was fairly good. As the disease progresses farther, the periodontium breaks down.

We have here a picture of true osteomalacia, a deficiency disease in which the principal symptoms manifest themselves in the absorption of the periodontal structures; truly, a form of rickets.

Naturally, even this type of case may be complicated by suppuration in its later stages when the periodontium breaks down and pockets form in which pyogenic bacteria may gain a foothold. Suppuration is always secondary to the underlying cause. This is quite a different problem from that of suppurative periodontoclasia, and no amount of local treatment will stop the progress of the disease.

The trouble here is that the metabolic processes have been disturbed. The mineral metabolism is in a negative phase. This may be due to a diet deficient in the mineral elements calcium, phosphorus, iron, copper, etc. More often, it is due to inability of the system to assimilate and fix those elements; a disturbed mineral metabolism, a rachitic condition.

Ultraviolet rays are rich in the antirachitic factor, whatever that may be, and their proper use in the treatment of this disease tends to restore the mineral balance to normal, and never beyond.

Thus, we have at hand an efficient means for treating this disease.

When the metabolic processes are functioning normally, a sufficient amount of the minerals, calcium, phosphorus, etc., are assimilated from the food for building and maintaining the bones and teeth, and to replace those which are lost through the excretory processes. For various reasons, some of which were just mentioned, the metabolic processes become deranged at times so that an insufficient amount of these elements is assimilated.

Whatever the cause of such a lowered calcium balance, Nature at once proceeds to draw on her one immediately available source of supply, namely, that which is stored in the bones.

Normally, the calcium concentration of the blood serum is approximately 10 mg. per hundred cubic centimeters. In order to maintain life, this concentration must be kept within rather narrow limits, and Nature will draw on any available source in order to keep it so. That is what is taking place in osteomalacia.

It is but fair to ask why the alveolar processes are attacked before the other bones show any effect. In a former paper, I called attention to the highly vascular structure of the bones of the alveolar processes.[1]

It is reasonable to believe that the mineral elements will be more readily absorbed here than in the denser bones, where the lymph and blood streams do not come into such intimate contact with the bone cells. That a certain amount of absorption of these mineral salts takes place in all bones in this condition, there is good reason to believe, and when the disease progresses far enough, the result becomes visible even in the larger and denser bones, which, however, lose a much larger percentage of their mineral salts before it becomes evident.

A very clear conception of both metabolic and catabolic processes is paramount to successful treatment of this disease. No treatment by rule of thumb will suffice. Needless to say, a sufficient diet and proper elimination are of first importance, and yet too often reliance is placed on some single form of treatment to the exclusion of all others of equal or even of greater import.

SYSTEMIC AND LOCAL TREATMENT

Both local and general body irradiation with ultraviolet rays is helpful in this disease. Body irradiation is primarily indicated for its antirachitic effect; in other words, for the purpose of restoring the mineral metabolism to normalcy, increasing the oxygen-carrying capacity of the blood and other biologic effects. The method of treatment, I shall describe in a moment.

Local irradiation of the mucous membrane overlying the alveolar process is of value for its stimulating effect. Proper irradiation is followed by hyperemia. This brings to the part a greater supply of blood. If steps have been previously taken to restore the mineral balance to normal, new mineral salts will be deposited in the rarefied bony stroma of the alveolar process.

Note that if such hyperemia is produced, while the mineral concentration of the body fluids is still so low that Nature is withdrawing these elements from the bones in order to maintain life, there will be a greater absorption as a result of the hyperemia. It is of first importance, therefore, that the mineral metabolism be restored to normalcy before any attempt is made to increase the circulation in the alveolar process that

1. Rasmussen, A. T.: Influence of Ultraviolet Rays on Periodontal Diseases, Arch. Phys. Therap., 11:212 (May) 1930.

has already suffered from absorption of its mineral elements.

There are other types of disease in which ultraviolet ray therapy may be used to advantage, but this discussion concerns itself only with the use of this form of energy in the treatment of periodontoclasia.

Briefly stated, ultraviolet ray therapy is indicated in all cases in which the biophysical or biochemical effects of the rays would be of benefit. To determine this, the physician or dentist must have a good working knowledge of the pathologic process as well as the means for treatment, its possibilities, limitations, etc.

SOURCES OF ULTRAVIOLET RAYS

The natural source of ultraviolet rays is sunlight. Unfortunately, the amount of ultraviolet energy reaching us from the sun is far from constant. Under favorable conditions, approximately 7 per cent of the total energy from the sun reaching the earth consists of ultraviolet rays.

At other times and places, practically all wave lengths shorter than 3200 A° are absorbed by the atmosphere or by impurities therein. In winter months in temperate zones, erythema-producing rays are almost absent from the sunlight.[2]

Of the artificial sources, there are three efficient ones; namely, the carbon arc, the air cooled quartz mercury arc, and the water cooled quartz mercury arc. The second and third are identical except in the method of cooling the tube in which the mercury vapor arc is enclosed.

The spectrum of the carbon arc depends on the type of carbon used. The intelligent operator will select the carbon best suited to the case.

The quartz mercury arc is the most efficient source of ultraviolet rays that we have, as much as 28 per cent of its entire output being ultraviolet. The spectrum from this type of generator is richer in the shorter wave lengths than is the case with the carbon arc.

The air cooled and water cooled quartz mercury arc generators *generate* exactly the same rays. The difference in the rays *emitted* from these two types of generators is dependent on the cooling arrangement.

The water cooled apparatus is more efficiently cooled, greater condensation of the mercury vapor surrounding the actual arc resulting, and thus the passage of the shorter wave lengths, which are absorbed by the generator itself in the air cooled type, are allowed. Hence, the water cooled generator is the more efficient source when a large percentage of the shorter wave lengths are desired. It is also more convenient for local treatment within the mouth, or any of the other body cavities, because the generator itself can be brought into close proximity as the infrared, heat-producing rays are absorbed by the circulating water.

Let it be distinctly understood that it matters not what the source of the rays is if they are properly applied in therapeutically active doses.

METHOD OF TREATMENT

In speaking of body irradiation, we shall consider only the carbon arc and the air cooled quartz mercury arc, as the two most practical types of apparatus for this purpose.

One method is to expose the entire surface of the body directly to the rays at each treatment. Another is what is known as the fractional method, whereby

2. Tonney, F. O.; Somers, P. F., and Marti, W. G.: Actinic Measurement of Solar Ultraviolet Light and Some Correlations with Erythema Dose, J. Prev. Med., 2:493 (Nov.) 1928.

only a portion of the body is exposed at one time. My preference is for the fractional method.

Dosage is made up of three factors; namely, intensity of the ultraviolet rays, distance from the source of the rays to the skin and length of exposure. As the efficiency of different generators, even of the same type and make, varies to a high degree, and the quartz mercury arc generator deteriorates with age to a slight extent, it is necessary to take into consideration, first of all, the efficiency of the generator at the time of use.

Dosage is spoken of as a first, second or third degree erythema dose or a suberythema dose. By erythema dose, we mean such exposure as will cause a slight erythema, or redness, of the skin a few hours after treatment, but which passes away within another few hours. Second and third degree erythema doses are such exposures as will cause more marked erythema, just as the term indicates.

This erythema should never be spoken of as a burn. Dentists and others have gotten in no little trouble because of their careless vocabulary. Burns are caused by infrared or heat-producing rays. Ultraviolet rays are not heat producing.

In giving a series of treatments, it is advisable to begin with a suberythema dose, and, if desirable, work up to the larger doses. It is further advisable to keep the skin light-sensitive by not giving more than a first degree erythema dose. Tanning of the skin is one of the visible results of irradiation and is Nature's method of protection against the rays.

When there is indication of tanning, it is a sign that the skin is losing its light sensitivity, and subsequent exposures should be given on some other part of the body. Thus, if treatments have been given on the back, the chest should be irradiated, or vice versa; or if both chest and back have been irradiated, the legs should be treated. It matters little what part of the body is exposed, if the skin is light sensitive.

No explicit directions can be given as to the time and distance of exposure. Each operator must learn this for himself by testing the generator for efficiency at various distances, voltages, etc., in a number of cases, thereby determining what, with the particular generator, constitutes an average erythema dose. He must then keep in mind that, as a rule, brunets are much more tolerant of the rays than are blonds.

In treating cases of osteomalacia or of suppurative periodontoclasia in which there is a disturbance of the mineral metabolism, it is well at first to give a treatment about every other day for a series of about ten or twelve treatments. The treatments can then be cut down to, say, one a week, in the winter time.

It may be necessary to repeat the more intensive series of treatments from time to time. This will depend entirely on the progress of the case, the purpose being to restore the metabolic processes to normal and to keep them so.

To give some idea as to dosage, I might say that, in using a double carbon arc generator equipped with metallic reflector, and the National Carbon Company's carbon C, operating on 1200 watts, alternating current, six minutes' exposure at a distance of 24 inches from arc to skin, will give approximately an average erythema dose.

In using an air cooled quartz mercury arc, with fixed resistance, two minute exposures at a distance of 30 inches will probably constitute the average erythema dose for such a generator when it is new.

These suggestions for dosage are not

given as a rule to be followed, but merely as a basis on which to determine the efficiency of any generator.

LOCAL APPLICATION

The local irradiation of the mucous membrane or other structures within the mouth is accomplished most conveniently by using the water cooled quartz mercury arc in combination with suitably shaped speculums and special quartz applicators, designed to direct the rays onto the tissues under treatment. It should be the aim of the operator to direct the rays as nearly as possible at an angle of 90 degrees to the surface being treated.

The structures should be kept free from saliva, mucus and blood and, needless to say, other débris. The sides of the quartz applicator must be kept away from the cheeks and tongue in order to prevent diffusion of the rays, and a possible erythema where not desired. Here again, the dosage depends entirely on the efficiency of the generator and the reaction sought.

In another paper,[3] I have outlined the method of determining the average erythema dose, using this type of generator, and I shall pass that by, merely saying that before attempting to use a generator for treatment purposes, it is highly important to determine the efficiency of generator and applicators. With my water cooled generator and applicators, from 600 to 700 volt-seconds, with tissues under pressure, constitutes an average erythema dose.

The efficiency of all applicators is rated in accordance with the one used as standard, and computations of dosage made accordingly.

Local treatments may be repeated every two or three days, unless severe erythema results, in which case no further treatments should be given until all evidence of erythema has disappeared, at which time the tolerance of the structures will be higher than the first time.

We have considered very briefly the use of ultraviolet rays in the treatment of two types of oral diseases, both of which result in a destruction of the supporting structures of the teeth, and eventually, if unchecked, in the loss of the teeth themselves.

There is much more that should be said in order to make the subject clear to those not already familiar with it. Those who have studied the subject to any extent have been able to follow my thought. Others are referred to the literature, my own writings as well as those of many others. We should always keep in mind that some writers are prone to go to extremes, one way or the other. Some make claims for this form of energy which apparently are not warranted and may even border on the ridiculous; while others dispose of the whole subject with an attempt at ridicule. Then, there is that large number of scientific writers who, searching for the truth, present the subject as it appears to them after long and careful observation and experimentation.

It is unfortunate that so many dentists have not sufficient training in biomedical subjects to comprehend readily the significance of symptoms which they are constantly seeing in their daily practice. This is, of course, largely a shortcoming of our educational methods, although not altogether so.

Fortunately, there is a rapidly growing conviction among members of the dental profession, as well as in the medical profession, that dentists of the future, speaking of the profession as a whole, must

3. Rasmussen, A. T.: Ultraviolet Radiation in Treatment of Periodontal Disease, J. A. D. A., 16:3 (Jan.) 1929.

have wider knowledge of all medical subjects, and that the day must come when the two professions shall be reunited, in order that the dental profession, as a whole, may have a better understanding of the entire body in health and in disease, and the members of the medical profession more knowledge of dentistry, one of the very important specialties of the healing art. Speed the day when our educators in both the medical and the dental professions will all lay aside petty differences, pride and personal ambition, and work together with an eye single to the best interests of society.

211-212 Linker Building.

DISCUSSION

Isador Hirschfeld, New York City: Until evidence is produced regarding the efficacy of ultraviolet irradiation in the treatment of periodontal disease tested with a control, I doubt the advisability of recommending the apparatus to the profession. I raise this question because recently it fell to my lot to discuss before the American Academy of Periodontology the question, "In what way can the Academy aid in promoting greater interest in periodontia?" One of the points brought out was to the effect that many dentists still persist in misinforming (with best intentions) their patients to the effect that "pyorrhea is not curable." The great number of unnecessary tragic results fostered by such misstatement are sufficient reason for a serious consideration of their causes. One of the outstanding causes seems to be the fact that too many drugs and implements are foisted on the profession, which are of little or no actual aid in the treatment of periodontal disease, with the result that the disappointed dentist, instead of condemning the method employed, questions the curability of the disease. I was rather interested in the statement to the effect that the dentist may or should himself do the body irradiation. I wonder if Dr. Rasmussen can inform us as to the legality of such procedure by the dentist.

Dr. Rasmussen: Dr. Hirschfeld asks whether any literature exists concerning experiments in the use of ultraviolet rays in the treatment of suppurative periodontoclasia in which controls have been used. I have raised the same question many times, and have sought for something on the subject but cannot say at this time that there is anything available. The difficulty that arises in attempting to carry out such experiments seems to be such that I, at least, have been unable to overcome them to my own satisfaction. If two individuals are used, one as the subject and another as the control, we have so many biologic conditions that may be different in the two that the experiments are not satisfactory. Laboratory methods cannot always be used in clinical experiments and this is apparently one of the cases in which that is true. As to the legal status of a dentist giving body irradiations: In all states with which I am familiar, the dentist is legally qualified to use any and all drugs or methods in treating disease or disease conditions of the oral cavity and associated parts. The mouth and all of its associated organs are a part of the whole body and what affects one part affects all. The law recognizes that fact in all states with which I am familiar. I have been asked whether I would use cod-liver oil when ultraviolet rays are not available. Yes, but I should make sure that the cod-liver oil is a standardized one. Viosterol or some of the tablets containing the potent factor of cod-liver oil are valuable and should certainly be used when ultraviolet rays are not available and even in conjunction with them. Other forms of medication are also used to advantage in connection with ultraviolet ray treatment in some cases. Attention has been called to some experiments that have been carried out at Columbia University pertaining to the penetration of ultraviolet rays, using a rabbit's ear. I am familiar with their findings. These and similar experiments confirm what I said about local treatments. I do not think it is necessary to repeat it at this time. Dr. Merritt asks on what I base my statement that an acidosis usually exists in cases of periodontoclasia. The statement is based upon physiologic urinalysis in a large number of cases. An ordinary analysis such as is made in a few minutes will not suffice, but careful laboratory examination will almost invariably reveal hyperacidity. Dr. Merritt further asks whether I think such acidosis is the cause of periodontoclasia. It is my opinion that the acidosis is a result of the disturbance rather than a cause. As there is, in many cases, a vicious circle established in which the resultant acidosis in turn aggravates the condition, you can see how important a factor

such acidosis may become. While ultraviolet rays are a potent factor in overcoming acidosis, I do not believe that reliance should be placed entirely on this method when we can, by proper use of antacids, change the reaction very quickly. In the end, of course, we should aim to reestablish normal metabolism, for which purpose ultraviolet rays are valuable.

EXPERIMENTAL PRODUCTION OF FOCI OF INFECTION*

By WILLIAM G. DOWNS, Jr., D.D.S., A.M., Ph.D., Evansville, Ind.

IN approaching the experimental study of the much-discussed subject of focal infection, it is well to sound a further warning as to the caution necessary in taking over into the clinical field information gained from purely academic and laboratory studies. It is well understood that dogs, which were the subject of this study, are not nearly so susceptible to many of the micro-organisms involved as are human beings. Therefore, the present study, like all others based on similar methods, should be very cautiously applied.[1]

Work on the experimental production of foci of infection was begun early in the spring of 1930. Several animals were utilized in developing technics and methods, until, in March of that year, four general groups of technics were developed. These are as follows:

1. One or more teeth were ground down and cultures of known material placed at the apices of these teeth.

2. Teeth were similarly ground down, but no culturing was done at that point, various kinds of damage being attempted elsewhere, to determine, if possible, whether more distant damage aided in the transmission of infection from the primary focus to a distant organ, or whether the teeth might themselves become secondary foci.

3. Teeth were ground down and the root canals left open to determine, if possible, the importance of invasion by the normal flora of the mouth.

4. After the production of roentgenographically positive apical lesions, these apices were opened from the buccal aspect and cultured, and apico-ectomy was carried out.

FINDINGS

The findings from these four series are as follows:

1. *Cuspids Ground Down and Apex Cultured.*—No. 21: March 10, 1930, the lower right cuspid was ground down and the material from the apex of the cuspid from A.2031 (roentgenographically positive) was placed at the apex. Examination was made by roentgen rays at three-day intervals for two weeks, then at weekly intervals, changes being noted. April 12, the animal was killed. Negative cultures were obtained from the apex and various organs. Histologic examination revealed a slight periapical fibrosis and few plasma cells. (Cultures from A.2031 were negative.)

No. 31: March 24, 1930, numerous strep-

*From the Department of Pathology, Medical School, Yale University.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

1. Rosenow, E. C.: J. Infect. Dis., 14:61, 1914.

tococci from A.1939 were placed in the root canal of the lower right cuspid. The animal died, May 27, three days later. Many gram-negative rods were found in the liver. Other cultures were negative. *Streptococcus viridans* was recovered from the apex. Histologic examination at the apex revealed some osteolysis, hemorrhage and polymorphonuclear infiltration.

No. 32: May 24, 1930, under amytal, the lower right cuspid was ground down and a small culture of streptococci from A.1941 was placed at the apex on a cotton swab, with an amalgam filling. Roentgen-ray examination was made weekly. The dog was killed, June 26, and negative cultures were obtained throughout, including the apex. Necropsy revealed pulmonary congestion. Fibrosis and plasma cells were found at the apex of the tooth.

No. 33: May 24, 1930, under amytal, streptococci from A.1940 were placed in the lower right cuspid. An amalgam filling was inserted. Roentgen-ray examinations to Jan. 13, 1931, revealed only a slight periapical change with cessation of growth of cuspid operated on (young dog). Necropsy was performed January 13. All cultures were negative, including that from the apex of the tooth. Histologic examination of this region revealed fibrosis, decalcification of the trabeculae and numerous plasma cells.

No. 35: July 8, 1930, the lower right cuspid was ground down and a culture of *Staphylococcus aureus* from a clinical case of furunculosis inserted in the canal on a cotton pledget. No filling was placed. Weekly roentgen-ray examination revealed some change in the periapical region. The animal was killed Jan. 16, 1931. At necropsy, nodules in the lungs, fibrosis of the myocardium, valvular endocarditis and scars in the kidneys were revealed. The cultures were negative except for mouth flora at the tooth apex.

No. 38: July 13, 1930, the lower right cuspid was ground down and staphylococci from a case of furunculosis were placed at the apex on a cotton pledget. The canal was filled with cement. The animal died fifteen days later. Cultures of the apical region were negative. From other organs throughout, *Streptococcus hemolyticus* was isolated. Histologic findings were not important.

No. 39: July 26, 1930, the lower left cuspid was ground down and a culture of staphylococcus from a clinical case was placed at the apex. An amalgam filling was inserted. Slight changes were revealed by the roentgenogram. When the animal was killed, August 23, all cultures were negative.

No. 40: July 26, 1930, the lower left cuspid was ground down and "Savo" cultures were placed at the apex. The animal was found

Fig. 1.—July 11, 1930, before root canal was opened. (These and the following illustrations refer to Dog 36.)

Fig. 2.—July 14, 1930, after root canal was opened.

dead, July 30, four days later. Cultures were positive for staphylococcus at the apex. Mixed organisms were found elsewhere. The histologic findings were not important.

No. 41: July 30, 1930, the lower right cuspid was ground down and a culture of hemolytic streptococci from dog No. 38, dying from endocarditis, was placed in the root canal. The animal died in thirty-six hours and was examined postmortem. Hemolytic streptococci were recovered from the apex. *B. proteus* was recovered from other organs. The histologic findings were not important.

No. 43: July 13, 1930, the lower left cuspid was ground down and a strain of streptococcus (39 s.) was placed and sealed in. The animal died in eighteen hours. The same strain was isolated from the apex, spleen and liver. The histologic findings were not important.

No. 47: Aug. 31, 1930, the lower left cuspid

Fig. 3.—July 30, 1930, before culture was placed.

Fig. 4.—Aug. 2, 1930, after culture was placed.

Fig. 5.—Nov. 20, 1930, three months after culturing.

Fig. 6.—April 16, 1931, before apico-ectomy.

was ground down and three colonies from strain 40 b. were suspended in 2 c.c. of saline with one loopful used as an inoculum inserted at the apex. The root canal was filled with copper amalgam. The roentgen rays show only slight changes. April 1, 1931, the animal was killed. Negative cultures were obtained from the apex. *B. proteus* was recovered from the kidneys.

No. 48: Aug. 31, 1930, both lower cuspids were ground down and sterilely filled and copper amalgam was placed.[2] October 9, the lower right root-canal filling was removed sterilely and strain 2150 S. was placed on a cotton point and reinserted. An amalgam fill-

Fig. 7.—April 25, 1931, after apico-ectomy.

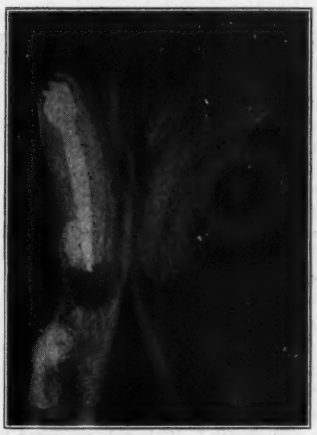


Fig. 8.—May 22, 1931, one month after apico-ectomy.

Fig. 9.—June 15, 1931, two months after apico-ectomy.

Fig. 10.—July 11, 1931, at necropsy.

2. Johnston, H. B.: Callahan Method of Root Filling, J.A.D.A., 18:1883 (Oct.) 1931.

ing was placed. Roentgen rays revealed similar changes on the two sides. September 8, the animal was killed. Culture revealed: right cuspid, a gram-negative rod; left cuspid, negative; spleen and liver, *Streptococcus viridans,* which did not agglutinate with 2150 s.; left kidney, *Staphylococcus albus* and *Streptococcus viridans,* which did agglutinate with 2150 s.; right kidney, negative.

2. *Teeth Ground Down with Damage Elsewhere.*—No. 26: April 18, 1930, both lower cuspids were ground down and a culture of the nonhemolytic streptococcus was injected into a femoral vein. The animal died in two days. Positive cultures of the same strain were obtained from practically all organs except the apices of the teeth, from which mouth flora only were obtained.

No. 27: April 26, 1930, all four cuspids were ground down and left open. Cultures of *Staphylococcus albus* in physiologic sodium chlorid solution was injected into the peritoneum. Roentgenograms taken to August 26, revealed slight rarefaction at the apices. When the dog was killed, cultures of the organs were negative. Mouth flora were found only at the apices, as well as the usual fibrosis, resorption and plasma cells.

No. 28: April 28, 1930, the cuspids were ground down and left open and the renal veins were constricted. The animal died in twenty-six hours. There was marked hydronephrosis. Gram-positive rods were recovered from the kidneys. Mouth flora were recovered only from the apices. The histologic findings were not important.

No. 29: July 12, 1930, the lower right cuspid was ground down, the pulp removed and the canal left open. A culture of *Staphylococcus albus* from case 39 was injected into the peritoneum. Roentgen-ray examination was made weekly. The animal died, October 20. Mouth flora only were isolated from the apex. Negative cultures were made from the heart blood. *B. coli* was recovered from the kidneys, *B. bronchosepticus* from the lungs, *Staphylococcus albus* and nonhemolytic streptococcus from the spleen. The histologic examination revealed thickening of the peridental membrane with extension into the lacunae. Plasma cells and lymphocytes were found in the surrounding tissues.

No. 42: July 30, 1930, the lower right cuspid was ground down and left open. A heavy culture of the hemolytic streptococcus from dog No. 38 was injected into the peritoneum. On necropsy, the hemolytic streptococcus was not found anywhere. Mouth flora were recovered only from the apex. The organs were negative.

No. 43: July 31, 1930, the right ureter was constricted. The lower right cuspid was ground down and a culture of the hemolytic streptococcus from dog No. 38 was placed at the apex. August 13, the animal was found dead and in a bad postmortem condition. A positive culture of the hemolytic streptococcus was recovered from the apex and right kidney. There was slight atrophy of the kidney. Histologic examination was not made.

No. 44: July 31, 1930, the left ureter was constricted and *Stephylococcus albus* was placed at the apex of the lower left cuspid. August 2, the animal died. Negative cultures were obtained from the apex and all organs except the lungs. Septic bronchopneumonia was general. The tooth histology was not important. Hydronephrosis was found in the left kidney, also, but of less degree in the right.

No. 46: July 13, 1930, the lower right temporary cuspid was ground down and 39 s. placed in the peritoneum by the Moon technic.[3] December 8, the animal was killed. Cultures were negative throughout. The permanent teeth were in excellent condition.

3. *Teeth Ground Down and Left Open for Invasion of Mouth Flora.*—No. 50: Sept. 8, 1930, both lower cuspids were ground down and left open. December 28, the animal was killed. Mouth flora were found at the apices. Other cultures were negative.

No. 52: Oct. 9, 1930, the upper right cuspid was ground down and left open; October 14, the lower right; October 17, the upper left, and October 21, the lower left. Jan. 21, 1931, the animal was killed. Cultures of the heart blood were negative. Other organs, except the lungs, were negative. The lungs showed gram-negative rods and *Streptococcus viridans.* The upper teeth were contaminated. The lower teeth yielded gram-negative cocci and many gram-negative rods, a few *Staphylococcus albus* organisms, and rarely *Streptococcus viridans.*

No. 55: April 1, 1931, cultures were made of the mucous membrane. The lower right cuspid was ground down and left open. April 15, the same procedure was carried out with

3. Moon, V. H., and Stewart, H. L.: Arch. Pathol., 11:190 (Feb.) 1931.

the lower left cuspid. Cultures of the spleen were negative; kidney and heart blood negative. The lungs showed *Staphylococcus albus*, and *B. proteus*. The lower left cuspid was negative.

4. *Apico-ectomies.*—No 36: July 12, 1930, the lower left cuspid was ground down and left open. July 30, a heavy culture of *Staphylococcus aureus* was placed at the apex. Roentgen-ray examination was made weekly. April 22, 1931, apico-ectomy was performed and cultures were taken (mouth flora only). July 11, the animal was killed. Cultures were negative throughout including the teeth. The lungs showed *B. proteus*. (Figs. 1-10.)

No. 58: May 27, 1931, both lower cuspids were ground down and left open. Cultures were made of the mucous membrane. Roentgen-ray examination was made weekly. September 5, apico-ectomy was performed on both sides. On the left, tribasic calcium phosphate was packed in the flaw. On the right, phosphatase and sodium glycerophosphate paste was packed in the flaw. September 12, the left bone wound was still open; in the right, dense, tough callus could be palpated. Cultures at operation revealed mouth flora and two types of gram-positive rods predominating. At the right apex there were two types of gram-positive rods as in the mouth flora. The left apex showed a gram-negative coccus. In a meat medium, both apices showed *Staphylococcus albus* and *Streptococcus viridans*. The animal was killed, September 28. Cultures were negative for both sides. Histologic findings were not completed.

No. 59: June 12, 1931, both lower cuspids were ground down and left open. Cultures were made of the mucous membrane. September 9, both teeth were extracted sterilely and the sockets cultured. Mouth flora only were found. Tricalcium was packed in the left socket, phosphatase and sodium glycerophosphate in the right. September 26, the animal died from osteomyelitis. *Staphylococcus albus* was found throughout.

It will be seen that these cases are not complete in every particular, but certain suggestions may be drawn from them:

1. If very large doses of bacteria are placed in this manner, the death of the animal is liable to result within a very short period.

2. The effect of doses of specific organisms not sufficient in amount to kill the animal is apt to be overcome by the natural defensive mechanism of the individual.

3. Roentgenographically typical periapical lesions may be best induced by leaving the pulp chamber open for the invasion of mouth flora.

4. Roentgenographically positive periapical lesions in dogs do not appear in less than about five months and may require a year or more to develop.

A PRELIMINARY SUMMARY OF THE FACTS PERTAINING TO DENTISTRY CONTAINED IN THE PUBLISHED REPORTS[1] OF THE COMMITTEE ON THE COSTS OF MEDICAL CARE

By DOROTHY FAHS BECK,* New York City

THE Committee on the Costs of Medical Care has now been engaged for about four years on a number of studies related to the economic aspects of the prevention and care of illness. This committee is composed of fifty members representing private practitioners of all branches of medicine, including dentistry, public health groups, institutions and special interests, economists and sociologists and the public. The research program has been extensive in scope, requiring a research staff and an annual budget of considerable size. Although the program is at present not entirely completed, the time for the preliminary conference of the committee to formulate the implications of the facts revealed is not far distant. Consequently, it is of interest to consider at this time in one unified picture the findings of the committee with reference to dentistry.

Up to the present date, the Committee on the Costs of Medical Care has published twelve full reports and eight abstracts of reports, in addition to a number of pamphlets and a series of miscellaneous contributions. In addition, it has cooperated with a number of independent organizations in work on related studies. Only those reports published prior to November 15, 1931, for which the Committee on the Costs of Medical Care has been directly responsible are included in this summary.

All the studies of the Committee on the Costs of Medical Care relate to three definite phases of the problems involved in the cost of medical care. The main classifications under which these studies have been organized are stated in the outline of the five-year program of the committee, as follows:

1. Preliminary surveys of data showing the incidence of disease and disability requiring medical services and of generally existing facilities for dealing with them.

2. Studies on the cost to the family of medical services and the return accruing to the physician and other agents furnishing such service.

3. Analysis of specially organized facilities for medical care now serving particular groups of the population.[2]

Since the studies of the Committee on the Costs of Medical Care were planned

*Member of the Research Staff of the Committee on the Study of Dental Practice of the American Dental Association.

1. This summary reviews all the reports of this committee published prior to November 15, 1931.

2. Publication No. 1, p. 14. (A complete bibliography of all the publications of the Committee on the Costs of Medical Care up to November 15, 1931, will be found at the close of this article.)

for the purpose of collecting facts on these specific subjects, this general classification will be followed in this summary.

EXTENT OF DENTAL DISEASES AND DEFECTS

With minor exceptions, the only concrete data published to date by the Committee on the Costs of Medical Care relative to the extent of dental disease and defects are contained in Publication Number 2, entitled "The Extent of Illness and of Physical and Mental Defects Prevailing in the United States," by Alden B. Mills. The information contained in this report regarding the incidence of dental disease and defects, although it represents the best available at the time, is still very inadequate, as is pointed out repeatedly by the author of the report. Many of the mouth examinations on which these figures are based were performed by physicians rather than dentists, and consequently recorded only those teeth in or about which caries or other diseases had progressed far enough to be readily observable. Furthermore, no data could be discovered on the extent of dental diseases and defects in the entire population of any section. Most of the available data pertained to children; information regarding adults and industrial workers was scarce and unreliable. Consequently, the figures presented in this report represent very selected groups only. Since these groups differed from each other in age, sex and degree of previous dental care, the findings also vary as to the extent of dental disease and defects revealed. Table 1 summarizes the results obtained from a number of studies quoted in this report. The table describes briefly the group of people examined, the professional status of the examiners and the percentage of the people found to have some dental disease or defect.

According to the records of the examinations performed by dentists reported in Table 1, from 65 to 97 per cent of preschool children and school children surveyed had some form of dental disease or defect. In contrast to these figures, one survey, in which the examinations were made by physicians, revealed dental disease or defects in only 33 per cent of the children examined; and another in only 54 per cent. The examiners whose professional status is not given in the report found that between 30 and 68 per cent of the preschool and school children examined had some dental disease or defect. As the examinations were conducted on such varied groups of children and under such varied conditions, no definite conclusions are possible regarding children as a whole; it is, nevertheless, apparent that a large percentage of children are in need of and are not receiving dental care.

The findings with reference to the number of cavities per child present an equally discouraging picture. Although the number of cavities found per person varied greatly according to age and a number of other features, in all the studies of children quoted by the author on this point the number of unfilled cavities averaged more than four per child.[3]

As shown in the table, the report includes only one statement of the percentage of persons in an industrial group having some dental disease or defect. A quotation from the report will serve, however, to indicate in a general way existing conditions among industrial workers:

> In an examination by a dentist of 545 employes of the Sangamo Electric Company of Springfield, Illinois, in the winter of 1926 and 1927, there were 706 cavities found, 348 extractions were declared necessary and 412 persons found who needed to have teeth

3. Publication No. 2, pp. 44-45.

cleaned. Of greater importance was the discovery of 123 persons with pyorrhea, quite a number "in the hopeless stage." In a recent examination of 220 working boys and girls from 15 to 17 years of age attending continuation schools in Chicago, 1,918 cavities were found, an average of nearly nine cavities per person. Twenty per cent of the teeth having cavities, the report stated, will have to be extracted.[4]

The conditions among other adults are not a great deal better. Physicians of the Life Extension Institute, when examining a selected group of white, native born professional and business men and skilled workers, actively at work during the prime of life, found that 39 per cent needed sufficiently extensive dental care to warrant the recommendation of roentgen-ray examinations, 18 per cent had slightly infected gums, 15 per cent had carious teeth or septic roots and 6 per cent had definite pyorrhea.[5]

From these various figures, collected from numerous sources by the Committee on the Costs of Medical Care, it may be concluded that in the general population there is a vast amount of dental disease and defectiveness which remains uncorrected. Although the exact extent or degree of these conditions has not been ascertained, it is apparent that dentists up to the present have been unable to eradicate dental disease and defects from a large proportion of the population.

TABLE 1.—SUMMARY OF THE PERCENTAGES OF PERSONS FOUND IN VARIOUS SURVEYS TO HAVE SOME DENTAL DISEASE OR DEFECT*

Description of Group Surveyed	Professional Status of Those Performing Dental Examinations	Percentage of Persons Found to Have Some Dental Disease or Defect
Male industrial workers (Workers in ten different industries examined some time during a ten year period)	Not given	61
Preschool children		
Detroit, 1926	Not given	30
Gary, 1918	Not given	65†
Pennsylvania, 1928	Dentists	67†
School children		
Detroit, 1927-1928	Physicians	33
Detroit, 1928-1929	Dentists	87
Missouri, 1919	Physicians	54†
Negro children, Atlanta, Georgia, 1925-1926	Not given	68†
New York City, 1921	Not given	56
Peoria, Ill., 1928-1929	Dentists	76
Philadelphia	Dentists	97†
Second grade children, Michigan rural schools	Dentists	87†

*Factual data derived from Publication No. 2, pp. 43-47, 65-67, or computed from data given on these pages.

†Percentage includes only those persons found to have unfilled cavities.

ADEQUACY OF EXISTING FACILITIES FOR PROVIDING DENTAL CARE

These thought-provoking revelations

4. Footnote 3, p. 41.

5. Footnote 3, pp. 39-40.

of the extent of dental diseases are an immediate challenge to a consideration of the adequacy of existing facilities for treating these conditions. The data on this subject contained in the published reports of the Committee on the Costs of Medical Care are derived from two types of sources: (1) statistical data already in existence, and (2) community surveys.

The only report utilizing data already in existence is Publication Number 3, by Allon Peebles, entitled "A Survey of Statistical Data on Medical Facilities in the United States." This report reviews some interesting statistics with reference to dentistry. The number of dentists in the United States is quoted as 67,334,[6] a figure derived from "Polk's Dental Register, 1928." The report also calls attention to the rapid growth of the profession of dentistry,[7] and a graph is presented which shows that the number of dentists in the United States has more than doubled since 1900.[8] It is pointed out that the allied specialty of dental hygienist, which is of comparatively recent origin, is already represented by approximately 1,800 members.[9] The number of dentists' assistants is estimated at 12,000,[10] and the number of dental technicians, at 10,000.[10]

The report also emphasizes the unequal distribution of dentists. In the following words, it summarizes the situation briefly and adequately:

> Like other professional groups, dentists are unevenly distributed throughout the United States. The ratio between the number of dentists and total population is as high as 1 to 500 in some urban centers, and as low as 1 to 4,000 in some rural communities. In 1928 the two extremes among the states were California with 103 dentists for every 100,000 people, and Mississippi with 19.
>
> The states of the South suffer from a shortage in their supply of dentists. This is particularly true for the Negroes in the southern states. In the country at large, the ratio of white dentists to population was, for 1925, 1 to about 1,700, while the ratio of colored dentists to Negro population was 1 to about 8,500. This does not mean that dental service to colored patients bears a close relation to these figures, for in the small cities, at any rate, white dentists often care for colored patients especially to relieve actual pain.[11]

The various community studies present further data on the facilities available for the treatment of dental disease and defects. Up to the present time only four of these studies have been published. The titles of these are as follows:

"A Survey of the Medical Facilities of Shelby County, Indiana: 1929," by Allon Peebles.

"A Survey of the Medical Facilities of the City of Philadelphia: 1929," by Nathan Sinai and Alden B. Mills.

"A Study of Physicians and Dentists in Detroit: 1929," by Nathan Sinai and Alden B. Mills.

"A Survey of the Medical Facilities of San Joaquin County, California: 1929," by Nathan Sinai *et al.*

As is apparent from the title, the Detroit study was not a complete survey of all the medical facilities of the city; it was conducted primarily for the purpose of furnishing supplementary data on physicians and dentists for comparison with the Philadelphia study. The reports of two additional surveys of similar character have not yet been published; one is to be called "A Survey of the Medical Facilities of the State of Vermont," and the other, "A Survey of the Medical Facilities of Typical Southern Counties." It is worthwhile to examine the various

6. Publication No. 3, p. 16.
7. Footnote 6, p. 29.
8. Footnote 6, p. 18.
9. Footnote 6, p. 30.
10. Footnote 6, p. 16.
11. Footnote 6, pp. 29-30.

community surveys already published by the committee in order to see what deductions are possible regarding the adequacy and quality of the available dental service in these communities.

Two of the surveys already published —namely, those of Philadelphia and Detroit—covered cities with a population of more than a million. The other two surveys covered entire counties. In San Joaquin County, California, the largest city, Stockton, had an estimated population of 48,000 in 1929; the county as a whole was 42 per cent rural in population.[12] Shelby County, Indiana, was 63 per cent rural in 1920, and had only one town of over 2,500 population; namely, Shelbyville, with a population of 9,701 in that year.[13]

According to the reports, these communities did not all have a similar proportion of dentists in relation to the total number of their population. The variations in the number of physicians and dentists to the total population in these various communities are shown in Table 2.

From Table 2, it appears that Detroit had the smallest number of dentists in proportion to population, and Philadelphia, the largest. With respect to physicians, San Joaquin County was the least well supplied, and Philadelphia, the best. No explanations for these variations are suggested in the reports.

The amount of time the average dentist in these various communities devoted to his practice also varied according to the community, but appeared to bear no inverse relationship to the supply of dentists in the community. According to rough estimates of the dentists, the hours they worked per week at their chair or in the laboratory averaged thirty-seven in San Joaquin County[14] and forty-eight in Philadelphia.[15] Both Detroit and Shelby County dentists reported averages of forty-four hours per week.[16] The great majority of the dentists replying in all these communities estimated that they treated, on the average, from five to twelve patients daily.[17]

In evaluating the supply of dentists in

TABLE 2.—RATIO OF DENTISTS AND PHYSICIANS TO THE TOTAL POPULATION IN SHELBY COUNTY IN 1928, AND IN PHILADELPHIA, DETROIT, AND SAN JOAQUIN COUNTY IN 1929*

Community	Number of Dentists per Hundred Thousand Population	Number of Physicians per Hundred Thousand Population
Shelby County, Indiana	52	123
Philadelphia, Pennsylvania	79	197
Detroit, Michigan	50	149
San Joaquin County, California	72	106

*Figures either quoted or computed from data given in Publication No. 6, pp. 22, 50, 151; Publication No. 9, pp. 27, 54; Publication No. 10, pp. 13, 32; Publication No. 12, pp. 7, 25, 141.

12. Publication No. 12, p. 9.

13. Publication No. 6, p. 13.

14. Computed from data given in Publication No. 12, pp. 51, 59.

15. According to Publication No. 9, p. 57, "most dentists spend 8 hours daily in caring for patients or in laboratory work."

16. Publication No. 6, p. 53; Publication No. 10, p. 34.

17. Publication No. 6, p. 53; Publication No. 9, p. 58; Publication No. 10, p. 35; Publication No. 12, p. 57.

these communities, the authors of the reports in all cases concluded that the supply of dentists was adequate to meet the needs of that portion of the population who wished dental service and were able to pay for it.[18]. In fact, in none of the communities was the public demanding the full professional energies of the available dentists, if the hours worked may be taken as any indication of such a condition. The situation in Detroit is evaluated as follows by the authors of the report:

> Are the 761 dentists in Detroit an adequate number to meet the needs of the people? The answer will depend upon the interpretation of the word "needs." Assuming that "needs" includes only those services for which patients are willing and able to pay, it is apparent that Detroit now has enough dentists, since three-fourths of them are devoting less than 33 hours per week to tasks for which they are paid, and since the dentists as a whole are spending one-third of their time in work for which there is no direct remuneration or in simply waiting for patients.[19]

It was equally clear to the authors of the reports that, according to the best scientific standards, the general population was not receiving adequate dental care, and could not receive adequate care if the supply of dentists were not increased. It was found that if all the dentists in Philadelphia were available for dental service seven hours daily, 300 days a year, a maximum of 1.7 hours of dental service yearly would be available to each resident of Philadelphia.[20] According to the Philadelphia report, "if the teeth of each person in the city were scaled and cleaned semi-annually it would consume approximately one hour per person, leaving but 0.7 hour apiece for many other services that are needed."[20] In Detroit, only one hour a year of dental service was available for each man, woman and child.[21]

In San Joaquin County, an attempt was made through actual counts of the number of different patients treated during the year 1929 by the various dentists to arrive at an estimate of the proportion of the total population of the county who received some form of dental care during the year. On the basis of these detailed counts, it was estimated that only about 37 per cent of the people of the county received some dental treatment from private dentists during the year. Since an additional 4 per cent received dental health service through the schools, a total of about 41 per cent of the population visited a dentist for treatment during 1929. This estimate is based on the assumption that no one person visited more than one dentist during the year; consequently, it probably slightly overstates the proportion of people receiving treatment. Furthermore, it does not imply that the 41 per cent, who visited some dentist at least once during the year, received all the dental care they needed. Probably most of the remaining 59 per cent who received no dental care or supervision during the year needed some form of treatment.[22]

The other community studies yet to be published will doubtless give additional information on these important questions of adequacy. In addition, these questions are being considered in greater detail by the committee than was possible in general community surveys. Dr. Lewis W. Jones and Dr. Roger I. Lee are attempting to estimate the amount and kinds of medical service required to meet the needs of the population of this country. Their report will be published under

18. Publication No. 6, pp. 141-42; Publication No. 9, pp. 265-66; Publication No. 10, p. 46; Publication No. 12, pp. 13-14.

19. Publication No. 10, p. 46.

20. Publication No. 9, p. 265.

21. Publication No. 10, p. 46.

22. Publication No. 12, pp. 19, 58.

the title "The Fundamentals of Good Medical Care."

In connection with the general question of adequacy, it is important to consider whether particular groups of the population are receiving proportionately less adequate care than others. The community surveys furnish sufficient data regarding three different groups within the population to warrant consideration in this summary: (1) children, (2) rural residents, and (3) persons of low income.

According to the reports of the surveys of Philadelphia and Shelby County, children's teeth suffer particularly from neglect.[23] Among the reasons which are suggested for this situation are a lack of a realization on the part of parents of the importance of early and careful attention to the teeth of children and their inability or unwillingness to pay adequate fees for the dental care of children.[24] The San Joaquin County report makes the following statement regarding the care of children in that area:

> It is believed that the public as yet does not recognize the importance of dental care for children and is not prepared to pay for these services at the rates which prevail for adults. Hence there is no inducement to specialists in dentistry for children to establish practice in the county, and much of the work now done for children by the family dentist is of casual quality.[25]

The data cited in these reports relative to the availability of dental service to rural residents is very fragmentary, but will doubtless be supplemented by the other community studies to be published later. Facts cited in the Shelby County and San Joaquin County reports suggest, however, that good dental care, particularly in its more specialized aspects, is not so readily available to the population in the sparsely settled districts as to the urban populations.[26] The San Joaquin County report makes the following statement in regard to the percentage of the population in the city of Stockton receiving dental care as compared with the percentage in the surrounding smaller towns and rural areas:

> To approximate the percentage of the people in Stockton who received dental attention in 1929 would involve an additional assumption —that the practice of the dentists in Stockton is limited to the residents of that city. In 1929, the population of Stockton was approximately 48,000; hence, if all the 29,000 different patients [treated by Stockton dentists in 1929] are considered as residents of Stockton, the fraction of the population in that city who received dental care in 1929 amounts to more than 60 per cent. On the same basis, the percentage for the rest of the county is only about 15. However, the records of Stockton dentists indicate that their patients reside in an area much larger than that of the city itself. Consequently, the actual percentage for Stockton is lower and that for the rest of the county higher than the above estimates indicate.[27]

In San Joaquin County, it also appeared probable that smaller communities were serving as temporary training grounds for young dentists who later moved to the city of Stockton.[28]

The statistics presented in the reports of the community surveys also suggest that the poorer classes in the population are receiving less adequate dental care than the wealthier groups. A quotation from the Shelby County report presents the situation as seen by the dentists in that district:

> There seems to be agreement among the dentists that ninety per cent of the industrial workers come for the relief of pain, and that extraction and amalgam fillings are the two

23. Publication No. 6, pp. 56, 143-44; Publication No. 9, pp. 230-31, 283.

24. Publication No. 6, p. 56; Publication No. 12, p. 56.

25. Publication No. 12, p. 14.

26. Publication No. 6, pp. 142-43; Publication No. 12, p. 54.

27. Publication No. 12, p. 58.

28. Footnote 27, pp. 51-52.

commonest types of service. They also agree that as a rule, because of the cost, the workers do not have bridge work. Their opinion is that four out of five workers come in for extractions and that about one-half who are recommended to return for the filling of cavities in teeth do not return because they cannot afford it. However, one dentist said that unmarried young people sometimes have bridge and inlay work done but that this is not true for parents of working-class families. It is also the consensus of opinion among the dentists that much needed dental work is neglected because industrial workers do not have the money to pay for it. One dentist estimates that probably eighty per cent of the workers need dental care but cannot afford it on account of the economic depression in Shelbyville.

The farmers have more and better dental work done than the city workers, according to the statements of the dentists. This is principally due, the dentists think, to the fact that they are in better economic circumstances than the factory employes. Fewer farmers come for the relief of pain and, while extraction is perhaps the most important type of service rendered, the farmers more frequently replace the lost teeth with bridge and plate work. As with the industrial workers, most of the fillings are amalgam.[29]

In the San Joaquin County, twenty-six out of sixty-three dentists stated that inability to pay was the chief reason for the fact that all residents of the county did not obtain dental care.[30] In Philadelphia, "only 55 per cent of the dentists report that the larger part of their practice is among patients with family incomes below $3,000 (although it is well known that more than 55 per cent of the families in industrial centers are in this group)."[31] The authors of the Philadelphia report have commented on this fact as follows:

These data all suggest that the poorer economic groups are not receiving dental attention which meets even moderate scientific standards. The failure on the part of the poorer families to receive health service appears more striking in the field of dentistry than in that of medicine. But it should constantly be borne in mind that under existing conditions physicians' services are provided to the lower economic groups by hospitals and by health departments to a greater extent than are the services of dentists.[32]

In Detroit, only 49 per cent of the dentists had 60 per cent or more of their practice among families with incomes under $3,000.[33]

A more exhaustive study of the relation between expenditures for medical and dental service and the income of patients than is contained in these community surveys is now in process. Fifteen thousand families were induced by the committee to record over the period of a year their expenditures for all types of medical service, including dentistry. Only a brief preliminary report of this study, presenting the results of a preliminary analysis of 4,560 family records, has so far been published.[34] The results of this preliminary analysis are, however, a definite indication of the relation between family income and the expenditure for medical care, as is apparent in the following quotation:

The charges for medical care apparently increase steadily with income: for families with incomes under $2,000 the average charge per family is $71.48 per annum, whereas $311.06 per annum is the average charge for those with incomes over $5,000. (More refined tabulation shows a range from nearly $66 per annum for those families with incomes under $1,200 to $520 per annum for those within incomes over $10,000.[35])

The average charges per individual in these families showed a similar variation. The average charge for all medical care for individuals in families with an in-

29. Publication No. 6, pp. 55-56.
30. Publication No. 12, p. 55.
31. Publication No. 9, pp. 265-66.
32. Footnote 31, p. 266.
33. Publication No. 10, p. 36.
34. Sinai, Nathan, and Klem, Margaret C.: The Costs of Medical Care: Preliminary Report, Miscellaneous Contributions on the Costs of Medical Care, No. 2, November 1, 1930.
35. Footnote 34, pp. 5-6.

come under $2,000 was $15.28 and that for those in families with incomes of $5,000 and over was $76.86.[36] No separate analysis for dental service is presented in this preliminary report. If previous studies under other auspices may be taken as an indication of existing situations, the final report of this study may be expected to show that expenditures for dental service are as directly related to the ability of the patient to pay as is the case with general medical service. The findings of the White House Conference on Child Health and Protection with reference to Philadelphia children, quoted in the Appendix of the Philadelphia Report, showed that children between 3 and 5 years of age from families of high economic status received dental health examinations much more frequently in 1930 than was the case with children of low economic status.[37] Michael M. Davis, in his review of the publications of the Bureau of Labor Statistics,[38] also makes this relationship between ability to pay and expenditures for dental care convincingly clear.

Another aspect of the extent of facilities for the treatment of dental disease and defects is the availability of specialists. The reports of the Committee on the Costs of Medical Care give little information on specialization which can be considered representative of conditions the country over. It is apparent, however, from the findings in the various community surveys that dentistry as a profession is not so highly specialized as is medicine. In Philadelphia, where a larger number of physicians and dentists were surveyed than in any of the other communities, 28 per cent of all physicians were found to practice a specialty exclusively,[39] while only 3 per cent of the dentists limited their practices to a specialty.[40] In Shelby County none of the dentists practice a specialty exclusively.[41] Periodontia, orthodontia and exodontia were the most commonly reported exclusive dental specialties in the two communities for which this information is cited in the reports.[42]

Although relatively few dentists reported that they were exclusive specialists, general practitioners and those specializing in part usually stated that they did not include all types of service in their practice. In all the communities orthodontia was more frequently excluded than any other type of service. The actual percentages of the dentists in general practice who excluded orthodontia cases were as follows: Shelby County, 69 per cent[43]; Philadelphia, 70 per cent[44]; San Joaquin County, 88 per cent (including those specializing partially)[45]; and Detroit, 90 per cent.[46] In addition, roentgenography, periodontia, oral surgery, ceramics and prosthodontia were excluded by a small proportion of practitioners.[47]

The reports offer little light on the supply of specialists in rural communities as compared to urban. However, the fact that no dentists practicing a spe-

36. Footnote 34, p. 6.

37. Publication No. 9, p. 283.

38. Davis, M. M.: Dental Care and Family Budget, J.A.D.A., 15:2039-2046 (Nov.) 1928.

39. Percentage computed from data given in Publication No. 9, p. 33.

40. Publication No. 9, p. 55.

41. Publication No. 6, p. 50.

42. Publication No. 10, p. 33; Publication No. 12, p. 54.

43. Percentage computed from data given in Publication No. 6, pp. 50-51.

44. Publication No. 9, p. 56.

45. Percentage computed from data given in Publication No. 12, p. 55.

46. Publication No. 10, p. 33.

47. Publication No. 6, pp. 50-51; Publication No. 9, p. 56; Publication No. 10, p. 33; Publication No. 12, p. 55.

cialty exclusively were found in Shelby County,[48] which is preponderantly rural in population,[49] and none outside of Stockton in San Joaquin County[50] suggests that possibly a more extensive study would show a decided concentration of specialists in the cities. According to the surveys of both Philadelphia and Detroit, specialists drew their clientele from families with considerably higher incomes than did general practitioners.[51] This fact also raises the question of the availability of specialists to those of low income.

The reports of the Committee on the Costs of Medical Care contain fewer data on the quality of dental service rendered than on the quantity. A few of the facts presented in the reports, however, make possible certain inferences with respect to quality. In all four communities surveyed, 94 per cent or more of the dentists had spent three years or more in dental school.[52] The specialists, although they had not spent more years in dental college than general practitioners, had in a larger percentage of cases in Philadelphia and Detroit pursued postgraduate study and study-club courses.[53] The San Joaquin County report contains an interesting summary of a number of interviews with dentists concerning the adequacy of their college training. The report gives the following summary:

> The 28 dentists who graduated within the past 10 years were asked to give an opinion as to the adequacy of their training. Twelve reported that the training in orthodontia was inadequate, especially the clinical training. Only one felt that his training in pedodontia (dentistry for children) did not equip him for this type of practice. Twenty members of the group stated that their training in what they termed "dental economics" was poor, and deplored the fact that upon entering practice they had no knowledge of costs, and were entirely dependent upon other dentists for information concerning fees.[54]

The only other possible measure of the quality of dental care considered in the reports of the Committee on the Costs of Medical Care is that of the percentage of dentists giving full-mouth roentgen-ray examinations to their patients. In Philadelphia, 19 per cent of the dentists estimated that they gave this type of examination to one-fourth or more of their patients.[55] In Detroit, it was found that 71 per cent of the specialists gave this type of examination to one-fourth or more of their patients, while only 31 per cent of the general practitioners reported this policy.[56] Likewise, 43 per cent of those dentists with 60 per cent of their patients having incomes over $3,000 gave full-mouth roentgen-ray examinations to one-fourth or more of their patients, while only 18 per cent of those dentists with 60 per cent of their patients having incomes under $3,000 gave such examinations.[56] From these latter figures it appears that thorough oral examinations with the aid of roentgen-ray pictures are not so frequently received by those of relatively small incomes as by those of higher purchasing power.

COST OF DENTAL SERVICE TO THE PATIENT

The second important topic considered by the Committee on the Costs of Med-

48. Publication No 6, p. 50.
49. Footnote 48, p. 13.
50. Publication No. 12, p. 54.
51. Publication No. 9, p. 59; Publication No. 10, p. 36.
52. Statement based on percentages either quoted or computed from Publication No. 6, p. 50; Publication No. 9, p. 55; Publication No. 10, p. 32; Publication No. 12, p. 53.
53. Publication No. 9, p. 55; Publication No. 10, p. 32.
54. Publication No. 12, p. 54.
55. Computed from data given in Publication No. 9, p. 57.
56. Publication No. 10, p. 34.

ical Care was the cost of medical service to the patient. Although the major study of the committee in this field has not yet been published, certain data obtained from the community surveys also throw light on the problem. By a complicated method of calculation, the authors of these reports estimated the total bills of these communities for medical care. These totals, when divided by the population, gave the approximate average expenditure of each person in the various communities. The estimated per capita expenditures for medical care are shown in Table 3, together with both the estimated per capita expenditure for dental service from private practitioners and the percentage this expenditure forms of the average total expenditure.

TABLE 3.—ESTIMATED PER CAPITA EXPENDITURES FOR DENTAL AND MEDICAL SERVICE: PHILADELPHIA, DETROIT, AND SHELBY COUNTY IN 1928, SAN JOAQUIN COUNTY IN 1929*

Community	Per Capita Expenditure		
	For All Medical Services	For Service of Private Dental Practitioners	Percentage of Total Spent for Dental Service
Detroit, Michigan	.....†	$5.46	....†
Philadelphia, Pennsylvania	$53.89	6.81	12.6
San Joaquin County, California	36.09	5.76	15.97
Shelby County, Indiana	21.32	2.19	10.3

*Data quoted from Publication No. 6, p. 151; Publication No. 9, p. 255; Publication No. 10, Complete prophylaxis

†Data incomplete, since the Detroit survey covered only physicians and dentists.

At first glance, the outstanding fact revealed by Table 3 is the very low per capita expenditure for dental service in all the communities. In none of the communities was the per capita expenditure for dental service over $7 per year. If these expenditures had been calculated on the basis of the number in the population purchasing dental care, rather than on the basis of the total population, as is the case in Table 3, the per capita expenditures would, of course, have been considerably increased. For San Joaquin County, where such an estimate was possible, the per capita expenditure based on the 37 per cent of the population estimated as purchasing dental service was $15.60,[57] rather than $5.76, the figure for the population as a whole.

A closer examination of Table 3 reveals certain variations between the communities. The per capita expenditures for dental service in both Detroit and San Joaquin County were between $5 and $6. The average expenditure of residents of Shelby County, however, was only slightly over $2, while that of Philadelphia residents approached $7.

It is difficult to offer a satisfactory explanation for these differences. The explanation of the relatively high expenditure in Philadelphia may lie in the large number of dentists in that city in comparison with the population referred to earlier in this report. The difference apparently cannot be explained by the per capita income of the population, since the average annual wage is higher in Detroit than in Philadelphia.[58] The per

57. Publication No. 12, p. 68.
58. Publication No. 10, p. 10.

capita expenditure figure for Philadelphia may also be artificially high because of the impossibility of eliminating in the totals the expenditures of nonresidents, particularly those of neighboring suburban comunities.[59] On the other hand, the estimates of the expenditures of the residents of Shelby County may be an underestimate because of the impossibility of taking into account the expenditures of actual residents of the county in urban centers outside the county, such as Indianapolis.[60] Yet it is probable that these differences in expenditures for dental service are not entirely the result of the difficulties in making estimates, but are rather evidence of real differences in the amounts of dental service purchased by the public in these various communities.

How much dental service could be purchased for these per capita expenditures can be determined only after a consideration of the average charges for specific types of service. These average charges, as reported by the dentists in the various communities surveyed, are given in Table 4. No averages were available for Shelby County because of the form of the questionnaire used.[61]

The similarity of charges in the various communities, as shown in Table 4, is interesting. The variations are insignificant with the exception of complete prophylaxis in Stockton. From the information given in the Shelby County report regarding the most typical charges for various services, it appears, however, that fees in Shelby County are considerably lower than those in the communities covered by Table 4.[62] The average charges probably do not actually represent the most typical charges in these various localities. In Philadelphia and San Joaquin County, the only communities for which medians are given, 50 per cent of the dentists charged slightly less than the average fees.[63]

By a consideration of these average fees in relationship to the per capita expenditures quoted in Table 3, some deductions

TABLE 4.—AVERAGE CHARGES FOR VARIOUS TYPES OF DENTAL SERVICE: PHILADELPHIA, DETROIT, AND SAN JOAQUIN COUNTY IN 1929*

Type of Service	Average Charges			
	Detroit	Philadelphia	San Joaquin County	
			Stockton	Outside Stockton
Scaling and cleaning	$3.25	$3.25	$ 3.11	$ 2.75
Complete prophylaxis	7.25	6.50	11.25	6.75
Simple amalgam filling	2.75	2.75	.....	.....
Compound amalgam filling	5.00	4.50	4.10†	3.91†
Full-mouth roentgen-ray examination	10.25	11.00	11.08	10.70

*Data quoted from Publication No. 9, p. 62; Publication No. 10, p. 37; Publication No. 12, p. 61.

†"Two-surface amalgam filling," rather than "compound amalgam filling," was the term used in the San Joaquin County questionnaire on dental practice.

59. Publication No. 9, p. 249.
60. Publication No. 6, pp. 149-50.
61. Footnote 60, p. 197.
62. Publication No. 6, p. 57.
63. Publication No. 9, p. 62; Publication No. 12, p. 61.

can be made with reference to the adequacy of the dental service received by the population in these various communities. Such a comparison involves the assumptions that the entire population needs some form of dental service and that the fees quoted are representative. Although these two assumptions are not unqualifiedly true, the error involved in their use is not sufficient to invalidate the comparison. In Detroit, after one scaling and cleaning has been paid for at average fees,[64] only $2.21 of the per capita expenditure is left for the purchase of other services. This remaining amount is insufficient to purchase any one of the other single services listed in Table 4. In Philadelphia, the per capita expenditure is sufficient to purchase one scaling and cleaning and one simple amalgam filling per year at average Philadelphia fees, but is insufficient for the purchase of any service, other than a simple amalgam filling, in addition to a yearly scaling and cleaning. Although the situation in San Joaquin County and Shelby County cannot be accurately determined, because average fees for the entire county are in neither case cited in the reports, the situations in these counties are obviously similar to those in the other communities. The per capita expenditure for dental service in all these communities is clearly inadequate to purchase at current rates the amount of dental service needed by the population, as judged by the incidence studies considered earlier in this paper.

That private dental practitioners are not unaware of the problem of the cost of dental service and are attempting some adjustment to it is indicated by various facts. Since the dentists, when requested, cited minimum and maximum charges as well as average charges,[65] it is obvious that some practitioners vary their fees for the same classification of service according to the ability of the patient to pay. The replies received to the questionnaires used indicate that when the patient is unable to pay the regular fee, the most common practice of dentists is to reduce the charge. About half of the Philadelphia and Detroit dentists reporting give free care when the situation demands it. Relatively few dentists refer patients to clinics under such circumstances.[66]

Up to this point in the summary, only those facts contained in the published reports of the Committee on the Costs of Medical Care which are directly related to the welfare of the public have been reviewed. It is equally important to consider the financial returns of the dentist who renders this service, since this aspect very vitally affects his personal welfare and indirectly the grade of dental service received by the public.

INCOMES OF THOSE FURNISHING DENTAL SERVICE

All these surveys included a study of the gross and net incomes earned by the dentists of the various communities. The reports of these studies also give a variety of information regarding the business procedures of dentists in conducting their practices. These various findings will be summarized briefly in the paragraphs that follow:

The average and median gross and net professional incomes of the dentists in private practice in Detroit, Philadelphia

64. The particular services cited in this discussion are chosen merely for the purpose of illustration; it is not to be implied that these services rather than others are the ones most frequently purchased.

65. Publication No. 6, pp. 56-57.

66. Publication No. 6, pp. 57-58; Publication No. 9, p. 59; Publication No. 10, p. 36.

and San Joaquin County, as revealed by the surveys of these communities, are shown in Table 5.

From a comparison of the various figures in Table 5, it is apparent that the average gross incomes of dentists in San Joaquin County and Philadelphia were about equal, as were also the average net incomes in these communities. The average gross incomes for both these communities were approximately $8,700. The average net income for Philadelphia was about $5,100, and that for San Joaquin County, only about $200 less. In respect to average income, Detroit dentists were apparently more fortunate than those in Philadelphia and San Joaquin County. Their net incomes averaged nearly $6,100, which is about $1,000 more than this average for Philadelphia, and about $1,200 more than that for San Joaquin County. As might be expected, the average gross income of Detroit dentists was also considerably above that in the other communities.

It should be remembered, however, that these averages represent only in a very generalized way the actual conditions in these communities. In reality, there was great variation in the incomes received by dentists. It should not be assumed, for example, that because Philadelphia and San Joaquin County dentists had similar average incomes, their financial status was similar. As is indicated by the median, 50 per cent of the dentists in Philadelphia received net incomes of less than $4,000; in San Joaquin County, however, only 44 per cent of the dentists had incomes below this amount.[67] In the average, those in Philadelphia with these low incomes were offset by an unusually large number of dentists earning high incomes. In Philadelphia, 7 per cent of the dentists had net incomes of over $12,500 in 1928,[68] while in San Joaquin County only 1 dentist out of 66 had a net income of over $13,000 the following

TABLE 5.—GROSS AND NET PROFESSIONAL INCOMES OF DENTISTS: PHILADELPHIA, 1928; DETROIT, 1928; SAN JOAQUIN COUNTY, 1929*

Community	Gross Income			Net Income		
	Average (Mean)	Median†	Range	Average (Mean)	Median†	Range
Detroit, Michigan	$10,433	$9,136	$3,000‡ to $33,000‡	$6,075	$5,393	$1,000‡ to $20,000‡
Philadelphia, Pennsylvania	8,715	6,717	Less than $1,500 to $44,500	5,102	4,000	Deficit of $2,000‡ to $22,000‡
San Joaquin County, California	8,741	8,167	$200 to $38,000	4,875	4,900	Deficit of $137 to $14,296

*Data derived from Publication No. 9, pp. 60, 64-66; Publication No. 10, pp. 40-43; Publication No. 12, p. 65.

†The middle figure when the various incomes reported are arranged in order of magnitude.

‡Since the actual figures are not cited in the reports, the midpoints of the class intervals of the extreme groups are taken to represent the limits.

67. Computed from data given in Publication No. 12, p. 64.

68. Computed from data given in Publication No. 9, p. 67.

year.[69] As seen in Table 5, both the highest net income and the greatest deficit recorded by any dentist in the course of these surveys were recorded by Philadelphia dentists.

With respect to the incomes of dentists, Shelby County presents a marked contrast to these urban centers. Although no averages for incomes were presented in the Shelby County report, the distribution of the net incomes of Shelby County dentists makes it apparent that these incomes were much lower than in any of the other communities considered. Of the thirteen dentists in that county, ten had net incomes under $3,500, and no dentist earned over $5,500 net,[70] which income is less than the average for dentists in Detroit.

Since these various surveys, with the exception of that of Detroit, were performed as strictly independent units, no attempt was made by the authors of the reports to explain the causes of these differences between communities in the incomes earned by dentists. Probably an analytical study of strictly comparable data for the various sections would reveal the joint operation of a number of determining factors, such as the ratio of dentists to the population, the density of the population, the per capita wealth of the community, the age distribution, the racial and social character of the population and so on. A possible explanation for the fact that the Detroit dentists were earning incomes so much above those prevalent in Philadelphia and San Joaquin County is suggested, however, in the Detroit report:

> It should be remembered that there are more doctors and dentists per hundred thousand inhabitants in Philadelphia than in Detroit. Moreover, a larger proportion of the population of Detroit falls in the wage-earning period (15 to 44 years), wages, on the average, are higher than in Philadelphia, and, although Detroit has a relatively larger foreign-born population, it has relatively fewer Negroes.[71]

Only two of the reports of community surveys include any discussion of the relation of years since graduation to income. The Philadelphia report makes the following statement with regard to this relationship:

> When net incomes of dentists and years since graduation are plotted on a scatter chart and a free-hand trend line is drawn . . . , the line that appears to give the best fit to the medians of the columns starts at approximately $2,000, climbs to slightly over $5,000 by the twelfth year after graduation and falls below $5,000 again at the thirty-fourth year. Compared with a curve drawn by a similar process for physicians, it appears that dental incomes start somewhat higher during the early years of practice, take a slightly longer time to reach the $5,000 mark but continue at that level somewhat longer before beginning to decrease. The computations are not accurate enough for more detailed comparisons.[72]

The San Joaquin County findings in general confirm these statements, but the net incomes earned by those dentists who had been out of dental college between fifteen and thirty years were somewhat higher. The report makes the following forecast for the earnings of the typical dentist in that county:

> These figures, broad estimates as they are, trace what might be termed the "income expectancy curve" of dentists in San Joaquin County. It appears that a dentist in this county may reasonably expect that by the end of his fifth year of practice his income will have risen to between $4,000 and $6,000 per annum, gross, and $2,000 to $3,000, net, and that it will continue to rise until it reaches its maximum some time between the twentieth and twenty-fifth year after his graduation. At that time his gross income may be predicted to be $12,000 to $14,000 and his net income $8,000 to $9,000. After that, however, his in-

69. Publication No. 12, p. 64.
70. Publication No. 6, p. 51.
71. Publication No. 10, p. 44.
72. Publication No. 9, p. 65.

come may be expected to decline, gradually at first, but more abruptly as the years advance.[73]

In conjunction with the gross and net incomes, the reports of the Committee on the Costs of Medical Care give detailed attention to the important subject of professional expenses. In San Joaquin County, the dentists spent on the average 44 per cent of their gross income for expenses,[74] and in Philadelphia and Detroit this percentage was 42.[75] In all the surveys for which this information is available, the percentages of the gross incomes spent for specific types of expense were nearly equal. The amount spent for salaried personnel range from 9 to 10 per cent; laboratory work, together with supplies, from 14 to 17 per cent; office rent (including light, heat and telephone) from 10 to 12 per cent, and depreciation on equipment, from 3 to 5 per cent.[76]

In San Joaquin County, 8 per cent of the gross income of dentists was spent for work done in outside laboratories.[77] More than half of all commercial laboratories contributing to medical care in San Joaquin County were dental laboratories,[78] as was also the case in Philadelphia.[79] Of the twenty-two dental laboratories reporting in Philadelphia, the median gross income was $14,536.[80] The median gross income of San Joaquin County dental laboratories is not given in the report of that county. If the laboratory fees reported are representative, it is considerably more expensive for San Joaquin dentists to have their laboratory work done outside than it is for Philadelphia dentists.[81]

In conjunction with yearly gross and net income, it is also pertinent to consider hourly gross and net income. In Detroit, the gross incomes divided by the number of productive hours during the year, as estimated by the dentists, averaged $7.75, and the average hourly net income, similarly calculated, amounted to $4.50.[82] Naturally, the tabulations show a considerable variation between individual dentists in average hourly income. Hourly income also varied according to the type of service being rendered, as was evident from the average hourly charges reported for various services. Of the four services studied in both Philadelphia and Detroit, the dentists reported the lowest average hourly charge for complete prophylaxis, and the highest, for simple amalgam fillings. The average hourly charges for compound amalgam fillings, although not so high as those for simple amalgam fillings, were also above those for scaling and cleaning, which in turn were more than those for complete prophylaxis.[83] The hourly charges for other types of service are not cited in these reports.

Other business problems closely associated with gross and net income are also of vital importance to dentists. In particular, it is interesting to consider the promptness with which dentists receive compensation for their services as well as their difficulties in collection. Only the San Joaquin County study and the Shelby County study give any data relative to uncollectible charges. These

73. Publication No. 12, p. 68.
74. Footnote 73, p. 69.
75. Publication No. 9, p. 64; Publication No. 10, p. 42.
76. Computed from data given in Publication No. 9, p. 64; Publication No. 10, p. 42; and Publication No. 12, p. 69.
77. Publication No. 12, p. 69.
78. Footnote 77, p. 133.
79. Publication No. 9, p. 100.
80. Footnote 79, p. 101.
81. Publication No. 9, p. 100; Publication No. 12, pp. 134-135.
82. Publication No. 10, pp. 38-39.
83. Publication No. 9, p. 63; Publication No. 10, p. 38.

surveys reveal great variations in the amount of the charges which were uncollectible.[84] On the basis of the San Joaquin study, it was concluded that "in general, the loss through uncollectible bills represents between 2 and 3 per cent of the gross charges."[85] In regard to the promptness with which patients pay their dental bills, the San Joaquin report states that "the experience of the majority indicates that approximately 53 per cent of all patients pay in full within one month."[86]

It is also interesting to consider some of the business procedures of the dentists in collecting their gross income. Of the dentists with private offices in Stockton, 69 per cent reported that they required a deposit in advance under certain conditions.[87] In Philadelphia, 89 per cent of the dentists replying reported that they occasionally required a deposit in advance,[88] and in Detroit 94 per cent so reported.[89] From the reports, it is apparent that deposits are required most frequently by dentists when: (1) the patient is unknown or has not been referred, (2) the patient is known to be a poor risk, and (3) the work to be done necessitates large outlays for materials.[90]

As an aid in determining the amount of the charge and the method of payment, it is, according to the reports, often customary to make inquiry with reference to the income of the patient. In Detroit, almost one-third of the dentists stated that this was their regular practice,[91] and in Philadelphia, 22 per cent followed this policy.[92] According to the Philadelphia report, 58 per cent of the dentists determined the income of patients by direct questioning; 16 per cent, by asking other dentists, and 8 per cent, by consulting business or rating bureaus. Miscellaneous methods based on personal judgment were used by 21 per cent, and 20 per cent used methods which they did not specify. Another 11 per cent had standard fees,[93] and hence had no need of these aids in determining the amount of their charges.

Another aspect of the business of conducting a dental office is the keeping of records. The Philadelphia report, which is the most complete on this point, states that "92 per cent of the dentists keep both case and financial records, 3 per cent keep patient records only and 5 per cent financial records only. A few keep special patient records, most of them roentgen-ray. Nine dentists use commercial record systems."[93] The percentages of Detroit dentists keeping these various records are, in general, similar, though slightly lower.[94]

No statement regarding the adequacy or inadequacy of dentists' incomes is contained in the reports of the Committee on the Costs of Medical Care. It is, however, interesting to compare the financial returns of dentists with those of physicians in the same communities. Since the proportion of the gross income spent by physicians for professional expenses differed from the prevailing proportions spent by dentists, and was not the same in all communities,[95] it is not logical to

84. Publication No. 6, p. 60; Publication No. 12, p. 63.

85. Publication No. 12, p. 63.

86. Footnote 85, p. 62.

87. Percentage computed from data given in Publication No. 12, pp. 51, 62.

88. Publication No. 9, p. 59.

89. Percentage computed from data given in Publication No. 10, p. 39.

90. Publication No. 6, p. 59; Publication No. 10, p. 39; Publication No. 12, p. 62.

91. Publication No. 10, p. 35

92. Publication No. 9, p. 59.

93. Footnote 92, p. 60.

94. Publication No. 10, p. 39.

95. Publication No. 9, pp. 45, 64; Publication No. 10, pp. 29, 42; Publication No. 12, pp. 46, 69.

compare the gross incomes of physicians and dentists. Neither can generalizations regarding net income, applicable to all the communities studied, be deduced, since dentists' incomes did not bear the same relationship to physicians' incomes in all the various communities surveyed. In Philadelphia, both dentists and physicians were receiving average net incomes of about $5,100.[96] In San Joaquin County, dentists had an average net income of about $2,300 less than physicians in that county.[97] In Detroit, dentists were earning on an average almost $500 more a year net than physicians.[98] The Detroit report makes the following comparison between the earnings of physicians and dentists there:

> Although the dentists have higher average incomes than physicians, the incomes from dentistry do not vary over so wide a range as do the incomes from medicine. No dentist reports a net income of less than $500, although 4 per cent of the physicians fall in this class. The highest net income reported by a dentist is approximately $20,000; one physician reports a net income of $27,000. Apparently in dentistry the financial stakes are less, and the security of financial return is greater.[99]

There is only one statement in the reports of the Committee on the Costs of Medical Care regarding the opinion of the two professions as to the adequacy of their own remuneration. This statement is as follows:

> With minor exceptions, the physicians and dentists of San Joaquin County have declared themselves on the whole content with the financial remuneration for their professional services.[100]

Of necessity, the facts relating to income and business procedure gathered from community surveys are fragmentary and relate primarily to local areas. The additional community studies now under way will increase the amount of detailed information available for particular sections. In addition, a nation-wide study of the income of dentists and dental practice, undertaken by the American Dental Association in cooperation with the Committee on the Costs of Medical Care, will, when published, supply information of national scope on many of these same questions.

SPECIALLY ORGANIZED FACILITIES FOR DENTAL CARE NOW SERVING PARTICULAR GROUPS OF THE POPULATION

Few of the specially organized facilities for medical care which have been studied up to the present time by the Committee on the Costs of Medical Care include dental services among those which they render to the public. When such services are included, the discussions in the reports do not furnish sufficient data to make possible any sound conclusions regarding the adequacy of these types of organization for furnishing dental service. They do frequently include enough data to indicate how satisfactory these forms of organization have been for furnishing other types of medical service.

One of the types of experiments studied by the Committee on the Costs of Medical Care related to the possibility of furnishing medical service to rural communities by means of physicians hired by the municipality. Such a system is in operation in rural Saskatchewan and is discussed fully by Dr. C. Rufus Rorem in Publication Number 11. The system as organized there does not include dental services, except where occasional extractions are performed by the municipal physicians.[101] It is not impossible, however, to reason from analogy that because this system proved on the whole

96. Publication No. 9, pp. 47, 65.
97. Publication No. 12, pp. 44, 65.
98. Publication No. 10, pp. 31, 43.
99. Footnote 98, p. 46.
100. Publication No. 12, p. 14.
101. Abstract of Publication No. 11, p. 9.

practicable and satisfactory when applied to other forms of medical care in these rural municipalities,[102] the results might prove similar if such experiments were extended to include dental service. The author himself states in the report that the problem of the equitable distribution of the cost of illness in rural communities has not been solved until dentistry, in addition to various other services not at present included, has been added to the other medical services furnished by the municipality.[103]

Private group clinics are another type of experiment studied by the Committee on the Costs of Medical Care. Since private group clinics are a recent development, this term itself requires some explanation. Private group clinics are defined in the report of Dr. Rorem, as follows:

> A private group clinic is an organization of practitioners who engage jointly in medical practice from which results a single service to patients and a joint income to the participating physicians and dentists. The clinic members offer services in more than one medical specialty, and usually provide all the diagnosis and therapy considered necessary for cases accepted by the group.[104]

A rather extensive investigation of a large number of such clinics in the United States revealed the fact that dentistry played only a very minor rôle in the work of such clinics. Only twenty-three dentists, or 3.8 per cent of the total number of practitioners in fifty private group clinics, were found to be dentists. Only seventeen of the fifty clinics furnished dental service to their patients.[105] Another analysis, including nineteen dentists working in group clinics, revealed only one dentist having any partnership interest in the ownership of the clinic.[106] No details regarding the volume or type of dental service rendered in these clinics or of the specific income resulting from such service are included in the report. Neither are any data given on the salaries of dentists employed by the clinics. The report discusses in some detail, however, the success of private group clinics in rendering general medical service. The final sentence in the report indicates the general tenor of the conclusions:

> Private group clinics, through their available equipment and their coordination of medical specialists, are in a position to fulfill the basic requirements of good medical care with economies from which either or both the clinic members and the public may benefit.[107]

There is little direct evidence presented upon which to base a judgment that this form of organization either is, or is not, satisfactory when extended to include dental service.

Industrial health service was the third type of specially organized facility for rendering medical service studied by the Committee on the Costs of Medical Care. The health service rendered by the Endicott Johnson Corporation to its employes was chosen as an example of such service, and a detailed study of this medical service was made by Dr. Niles Carpenter. In his report of this study, Dr. Carpenter makes the following statement with reference to the dental service furnished to the workers of the Endicott Johnson Corporation and their families:

> Provision is made only for simple dental repair, extractions, and dental hygiene. The service employs only 4 dentists, 1 of whom is on a part-time basis. This makes a ratio for the service of approximately 1 dentist to 8 physicians. In New York State at large there are about 386 dentists per thousand physicians, or a ratio of more than 3 to 8. In other words, assuming the state as a basis of comparison, if the Endicott Johnson Company

102. Footnote 101, p. 18-20.
103. Footnote 101, p. 20.
104. Publication No. 8, p. 105.
105. Footnote 104, p. 33.
106. Footnote 104, p. 30.
107. Footnote 104, p. 111.

attempted to supply dental care on the same basis as it furnishes medical care, the organization would require at least three times as many dentists as it actually employs. Even then, of course, part of the dental work would have to be done outside, as actually obtains in the case of medical services.[108]

Since a large part of the dental service of the Endicott Johnson Corporation is furnished free of charge, the cost of dental service received by these employes was found to be less than the cost of dental service received by a comparable group of outside families.[109] The data regarding these two groups suggest, although by no means conclusively, that, as a consequence of the free service, a slightly higher proportion of persons in the families of the employes received dental service during the period of the study than in similar workers' families outside the corporation. Similarly, the families of Endicott Johnson employes availed themselves, during the period of study, of a greater volume of dental service per person than did families of workers not employed by this corporation.[110] No information is given in the report concerning the quality or adequacy of the dental service rendered employes of the corporation. Neither is there any discussion of the cost to the corporation of furnishing this service, nor of the remuneration of the dentists engaged in the service. Consequently, industrial dental service can hardly be judged on the basis of this particular study.

Two other studies of industrial health services are being conducted by the committee, but the reports of these have not yet been published. Either or both of these studies may furnish additional information regarding the feasibility of furnishing dental service to the industrial population through health service departments conducted by the industries employing the workers. A nation-wide study of industrial health service is also being conducted jointly by the Committee on the Costs of Medical Care and the National Tuberculosis Association.

A fourth type of organization for furnishing medical service to a particular group is also being studied by the Committee on the Costs of Medical Care; namely, student health service. No report on the results of this study has yet been published. Since it is to cover six universities, two of which have good dental departments, the report will probably furnish information on which some judgment of this form of organization may be based.

CONCLUSIONS

The Committee on the Costs of Medical Care has not yet either summarized its research findings or formulated its final conclusions. At a later date the committee is expecting to publish a résumé and analysis of these research findings under the title, "The Economics of Medical Care." The final conclusions of the committee on the basis of all the available data will be drawn up by the members of the committee at their final conference in 1932, a report of which will also be published. Although advance conclusions at this time must, of necessity, be immature, it is interesting to speculate regarding conclusions which the committee might ultimately reach. A consideration of the information already published by the committee with reference to dentistry would seem to lead any thoughtful reader to a few tentative conclusions, such as those which follow.

An appalling amount of uncorrected dental disease and defects exists among the general population. In particular, children, rural residents and persons of

108. Publication No. 5, p. 51.
109. Footnote 108, p. 52.
110. Footnote 108, pp. 51-55.

small income are not being adequately cared for under present arrangements. Nevertheless, the public as a whole is not demanding the full time of the dentists already practicing, and there is little evidence that, without further educational efforts, more dental service, if made available at present rates, would be purchased by the public.

No conclusive evidence is presented as to the reason for the failure of the population to demand the correction of these dental diseases and defects at present prices. There is some suggestion in the reports that extensive educational efforts would increase the demand. Various indications in the findings make it clear, however, that one of the major reasons for the failure of the people to demand complete dental service is their inability to pay the present cost of such service. If small incomes are one of the fundamental reasons for the failure of the population to purchase adequate dental service, and if these incomes are not markedly increased, then some method of lightening the burden of the cost of dental service to the lower income groups must be found if the dental needs of the public are to be met adequately and scientifically.

This consideration suggests an examination of the possibilities of decreasing the cost of dental service. Although no judgment of the adequacy or inadequacy of the incomes of dentists is contained in the reports of the Committee on the Costs of Medical Care, the various community surveys do not reveal average incomes from dental practice which to the general reader would appear unreasonably high for men in a professional pursuit requiring a high quality of education and skilled service. A great number of dentists appeared to be receiving surprisingly low net incomes. Any new forms of organization for dental service designed to extend dental service to a larger proportion of the population, therefore, cannot be expected to reduce the cost of dental service by reducing the present net remuneration of dental practitioners without seriously lowering the general standards of the profession.

Experiments in forms of organization which might reduce other costs involved in rendering dental service, such as overhead expenses, have not yet been considered by the committee in sufficient detail to warrant any conclusions regarding the feasibility of reducing these costs of dental service through such forms of organization. Consequently, the data made available thus far by the Committee on the Costs of Medical Care, although clearly indicating the need for experimentation along these lines, do not make possible at this time any definite recommendations with regard to the advisability of adopting other forms of organization than private practice for rendering dental service. Later publications of the committee will undoubtedly give more extensive consideration to these problems so vitally important to the extension of dental service to those at present not receiving adequate care.

THE PUBLICATIONS OF THE COMMITTEE ON THE COSTS OF MEDICAL CARE*

No. 1. "The Five-Year Program of the Committee on the Costs of Medical Care." February, 1928.

No. 2.† "The Extent of Illness and of Physical and Mental Defects Prevailing in the United States: A Compilation

*All publications listed may be obtained from the University of Chicago Press, 5750 Ellis Avenue, Chicago, Illinois, which was recently appointed publisher for the Committee on the Costs of Medical Care.

†A brief abstract of this report has been published in addition to the full report.

of Existing Material." By Alden B. Mills. November, 1929.

No. 3.† "A Survey of Statistical Data on Medical Facilities in the United States: A Compilation of Existing Material." By Allon Peebles. November, 1929.

No. 4.† "Hospital Service for Patients of Moderate Means: A Study of Certain American Hospitals." By Niles Carpenter. April, 1930.

No. 5.† "Medical Care for 15,000 Workers and Their Families: A Survey of the Endicott Johnson Workers Medical Service, 1928." By Niles Carpenter. September, 1930.

No. 6.† "A Survey of the Medical Facilities of Shelby County, Indiana: 1929." By Allon Peebles. June, 1930.

No. 7. "Capital Investment in Hospitals: The Place of 'Fixed Charges' in Hospital Financing and Costs." By C. Rufus Rorem. November, 1930.

No. 8.† "Private Group Clinics: The Administrative and Economic Aspects of Group Medical Practice, as Represented in the Policies and Procedures of 55 Private Associations of Medical Practitioners." By C. Rufus Rorem. January, 1931.

No. 9.† "A Survey of the Medical Facilities of the City of Philadelphia: 1929: Being in Part a Digest of the Philadelphia Hospital and Health Survey, 1929." By Nathan Sinai and Alden B. Mills. July, 1931.

No. 10. "A Study of Physicians and Dentists in Detroit: 1929." By Nathan Sinai and Alden B. Mills. March, 1931.

No. 11.† "The 'Municipal Doctor' System in Rural Saskatchewan." By C. Rufus Rorem. July, 1931.

No. 12. "A Survey of the Medical Facilities of San Joaquin County, California: 1929." By Nathan Sinai, *et al.* October, 1931.

INFLUENCE OF PERIODONTAL INFECTION ON PARANASAL SINUSES*

By JOHN J. SHEA, M.A., M.D., Memphis, Tenn.

THE paranasal sinuses and the upper molars have their nativity in common and share one with the other their development. The cancellous bone about these teeth forms the floor of the maxillary sinus and their diseases are transmitted directly. Berry[1] has emphasized to the sinuologists the importance of periodontal infection as the cause of chronic maxillary sinusitis and "that 60 to 80 per cent, rather than 20 per cent, would be a more accurate estimate for dental complications . . . that a dead tooth which in the film reaches or extends near to the floor of an antrum is an active menace, which must be carefully watched and seriously considered."

DEVELOPMENT

All of the teeth of the true maxilla may be in contact with the floor of the maxillary sinus. The deciduous molars

*Read before the Section on Periodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

1. Berry, Gordon: Tr. Am. Laryng. A., 50:136-149, 1928; 51:129-140, 1929.

at birth lie in the cancellous bone adjacent to the rear end of the antrum. As the antrum pneumatizes, it extends backward and downward, pushing down and behind it the bone containing the deciduous molars. When the antrum is small, the roots of the first molar may not contact with its floor. The second molar is in contact with the antrum, unless some marked deformity occurs. If the natural pneumatization of the antrum occurs, the third molar is crowded down into place and its roots contact with the floor of the antrum. Should pneumatization be excessive, the roots of the third molar are made more prominent within the

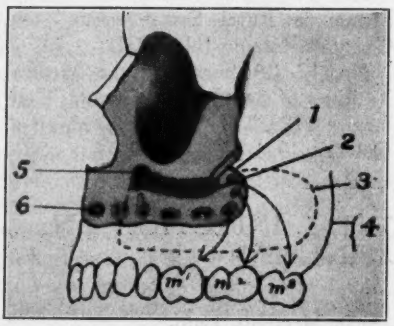


Fig. 1.—Manner in which development of maxillary antrum affects size of palate and position of molar teeth. (After Keith.)

sinus. I believe that a large percentage of the unerupted upper third molars owe their position to the failure of the posterior wall of the antrum to develop backward and downward. This unerupted molar is then in close contact with the antrum and will exert a marked influence on the antrum. An abscess of an unerupted upper third molar will produce a purulent state within the antrum. This is well illustrated by the following case:

M. M., aged 15, came in, Feb. 16, 1931, with an acute upper respiratory infection. In spite of local treatment and immunization, the discharge of the right antrum became purulent. The antrum was irrigated several times and a window was made through the naso-antral wall and drained continuously through a No. 4 French rubber catheter. The patient consulted W. J. Templeton, of the Dental Department of the University of Tennessee, whose report was as follows:

This patient came in, March 5, complaining of an aching sensation in the upper right molar region. Examination revealed a broken down amalgam restoration of the upper first molar; tenderness of the first and second molars upon pressure; an absence of the upper right third molar, with extreme tenderness on palpating over the second molar, and a hyperemic condition of the upper right side, especially of the molar region. Test showed the upper right first and second molar to be low in vitality and the remainder of the teeth vital. Roentgen-ray examination revealed mesio-angular impaction of the upper right

Fig. 2.—Type of infection about incisors that produces obstruction of vestibule of nose.

third molar, involving the second molar. Active infectious areas were present around the roots of the first and second molars and the crown of the third. The lingual root of the upper second molar and the roots of the upper third were in close proximity to the antrum, possibly opening into the sinus.

Removal of the amalgam filling revealed secondary caries under the filling, which was very close to the pulp, but there was not an actual exposure. It was decided to remove all three molars at the one operation. The roots of the third molar were found to penetrate the floor of the sinus. The postoperative treatment consisted of the use of small wick drains for two or three days.

After the extractions, the antral drainage became less purulent and gradually subsided.

This case illustrates the importance of infections about an unerupted third

molar. This antrum was scientifically treated nasally with little result, until the periodontal infection was eliminated.

Infection of the paranasal sinuses will arrest their pneumatization. The sinuses reflect in their growth the infections that they have experienced. A single severe infection cripples the sinuses as badly as many mild attacks. The reestablishment of growth is a good prognostic sign. This is well illustrated by the following case:

M. W., aged 8, was referred for drainage of the sinuses. The roentgenogram showed the antrums to be filled with discharge and the lack of development of the antrums was accompanied by poor dentition. A second roentgenogram taken one year later, after the sinuses were cleared of the infection and the growth of the sinuses was reestablished, revealed a corresponding improvement of dentition.

Fig. 3.—Dental and sinus conditions in case of G. P.

CUSPID AND INCISORS

In rare instances, the cuspid tooth will have a direct relationship with the antrum, and, in still rarer cases, where the anterior end of the antrum has developed anteriorly under the floor of the nose, the incisors will have a direct contact with the antrum.

The periodontal infections about the cuspid and the incisors will produce a swelling of the structures in the vestibule of the nose, with blockage of the air passages.

This stasis is accountable for considerable complaining on the part of these patients and makes them susceptible to colds. Cysts of the incisor teeth may migrate backward and laterally until they enter the antrum. In their migration, they are prone to destroy the nerve and blood supply of any tooth that lies in their path.

Mrs. C. G. M., aged 29, referred by Dr. Sherman, Aug. 30, 1927, complained of a swelling over the left antrum. The nasal examination revealed a purulent discharge coming from the left antrum. The antrum was filled with lipiodol and a large dental cyst invading the antrum from its anterior angle was revealed. The dental film showed that the cyst arose from the lateral incisor and had progressed backward, destroying the nerve supply to the cuspid and two bicuspids. The four teeth were removed by Dr. Sherman, and I removed the dental cyst. Great difficulty was experienced in obtaining a closure of the antral wound.

SUSPECTED TEETH AND ANTRUM

The most common consultation between dentist and sinuologist relates to the clinical significance of pulpless or infected teeth, whose roots cast a shadow in the floor of the antrum in a roentgen-ray film. If the tooth is pulpless; the condition of the periodontal tissues is questionable, and the roots appear to be in an infected antrum, I believe the tooth should be removed and the antrum be drained. The dental opening should be encouraged to close as soon as possible, for it is not natural to have an opening into an air sinus from a fluid-containing cavity, and as long as such an opening remains, the air sinus will be infected. A small window may be made under the inferior turbinate, through the naso-antral wall, or the natural ostium may be dilated and daily irrigated. Whenever an antrum is crippled, it is a good procedure to shift the responsibility for its physiologic processes to other parts of the body. The sinuses are closely related in their activity to our daily auto-immunization against respiratory infections, and when they are not functioning normally, the hypodermic administration of milk, etc., will carry on this function. Should the sinus continue to suppurate after the removal of the teeth, operation will be necessary.

These decisions should not be made lightly, and time is necessary to allow the changes to occur between the dental procedures and the condemnation of the sinuses.

G. P., aged 60, had been a sufferer with ethmofrontal sinusitis for years, but, with careful and frequent nasal treatments, had been able to protect the antrums. During the past winter, the antrums began to accumulate a purulent discharge, which required repeated irrigation. A dental study was ordered and the molars were suspected as an etiologic factor. All the upper teeth were removed. For a time the antral discharge ceased, and it would have cleared up entirely save for an unfortunate intercurrent upper respiratory infection. Early in the following summer, as the antrums still contained residual pus, a bilateral radical maxillary operation was performed, with successful results.

The periodontal infection was the agent in the failure of function of these antrums.

MISPLACED TEETH

Unerupted teeth that migrate into the antrum will act as foreign bodies within the sinus and should therefore be removed. I have seen one antrum that contained three fully developed teeth. The first molar had rotated, the crown facing upward into the antral cavity.

In another case, a single second molar was embedded in the floor of the antrum. The crown was fully developed and encased in bone, while the roots extended through the antral membrane and were projecting into the cavity, denuded of any membrane, nerves or blood vessels. It was necessary to perform a radical

antral operation to remove this tooth, in order to clear up a chronic infection of the maxillary sinuses. Sometimes, the misplaced tooth may cause only pain referred to the antrum. This does not have to be an upper tooth. Recently, a young woman with a misplaced lower third molar consulted us for pain in the antrum of that side. Examination revealed that a lower third molar had migrated up the ascending ramus of the inferior maxilla to a level of the upper teeth. Extraction of this tooth, by W. W. Oursler, brought relief.

RADICAL ANTRUM SURGERY

We are today seeing more radical antral operations, and the question arises, Will the buccal approach to the antrum devitalize teeth below the incision? In my experience, the teeth retain sufficient nerve supply. On the other hand, I have had failures to obtain relief of the antral condition or closure of the buccal wound after radical operation until pulpless or infected teeth in its floor had been removed. My experience indicates that the teeth approximating the antrum should be studied, and if they are pulpless or infected, they should be removed at the time of operation. This will allow of removing, by direct vision, any diseased bone about the teeth. This same diseased bone may be a focus of infection, and its presence after the extraction of teeth may be overlooked in studying the mouth for an infection. When the extraction of the adjacent upper molar fails to influence the antral infection, the alveolar process should be carefully examined by the roentgen rays and the bone studied. I have seen it necessary that this diseased bone be removed from the alveolar process until the antral membrane was visible. A gingival exposure at the time of extraction is the only safe procedure when there is a probability of the antrum's being infected by the teeth. Dr. Shearer described an operation embodying these ideas, as a part of the instructional course of the American Academy of Ophthalmology and Otolaryngology, in 1926. The flap made by the operation seldom holds in its entirety, and further treatment is necessary. As the antrum must be kept dry while healing, a dental protector should be made to cover the aperture, such as a removable bridge with lips extending high about the alveolar process. The antrum can be kept drained through a nasal window by the insertion of a small rubber tube under the inferior turbinate. This is important; for discharge within the sinus will settle to the lowest level, which is at the site of the aperture. The buccal epithelium is prone to grow through the fistula and keep it patent. This overgrowth can be retarded with trichloracetic acid or a solution composed of sodium sulphid 72 grains, sodium carbonate, 20 grains, and distilled water to make 1 ounce. Two or three treatments a week for a month are necessary in these persistent fistula cases, and then the time between visits can be gradually lengthened. It may require several months of patience for the fistula to heal.

1018 Madison Avenue.

ADVANCED RADIODONTIC INTERPRETATION*

By CLARENCE O. SIMPSON, M.D., D.D.S., F.A.C.D., St. Louis, Mo.

THE general lack of proficiency in radiodontic interpretation and the slight progress which is being made in this field are principally due to the confusing ideas associated with the subject and the low plane of the prevalent service. Soon after radiodontia passed the stage of merely revealing the teeth and gross bone lesions, there was a tendency to apply to interpretation clairvoyant methods and erratic theories, which has continued until the present. Some volunteer authorities having only a speaking acquaintance with radiodontia proposed to differentiate the strains of the invading bacteria and to determine the physical resistance of the patient and the state of mineral metabolism from radiodontic evidence. An attempt has been made to standardize interpretation through the relative degrees of radiolucency of different structures, as with a porcelain shade guide. These suggestions have been perplexing to the casual student.

The individual and imitative nomenclature which has been applied to interpretation approaches in variety that which has been proposed for pyorrhea alveolaris. With the aid of "itis," "osis," "atrophy" or "plasia," new terms have been coined with abandon. To imitate the American Medical Association, the attempt has been made to impose the unscientific and unwieldy Roentgen nomenclature on the dental profession. The established anatomic, pathologic and radiodontic terms need no such embellishment for accurate and lucid description.

The usual inferior radiodontic service offers no opportunity for refined interpretation and compels guessing to serve as an inadequate substitute. The technical deficiencies lie in the scope of the examinations, the perspective and definition of the images and the chemical processes. With an insufficient number of views, distorted and blurred images and extremes of density, the evidence is indefinite and misleading. That which is not legibly recorded cannot be read, and the only means of registering the desired information is by learning to write. There is no prospect of acquiring a knowledge of interpretation by studying images which do not reveal the structures affected by disease.

Dentists who profess to practice radidontia must learn to make adequate examinations or be liable for misrepresentation in the moral and legal responsibilities assumed. Patients believe that a radiodontic examination will truly disclose conditions, and when they learn that their health has been jeopardized by inefficient examinations, they will hold the examiners responsible. There are malpractice suits for neglecting to have radiodontic examinations, and the liability is greater for incompetent examinations which lead to mistreatment.

The technical essentials for advanced

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

interpretation are thorough examinations, anatomic perspective, sharp definition, maximum detail and intermediate density and contrast. Thorough examinations entail a sufficient number of views to present the necessary different aspects of the teeth and alveolar process. The number of views required of each region range from two as a minimum upward to the limit of safe exposure for an extremely difficult region. For a routine general examination, sixteen views are the minimum when there is no special indication for different aspects of the third molars and mandibular central incisors. This provides for three views of the maxillary incisor region to shift the images of the superimposed structures and compensate for the curve of the arch. Anatomic perspective is secured by placing the film packets and calculating the angles of projection to minimize distortion and superimposition of the images. Sharp definition requires immobility of film packet, patient and tube, ample target-film distance and the smallest practicable focal spot. Maximum detail is obtained by just sufficient penetration and exposure to register the densest bone and tooth structures. Intermediate density and contrast are secured by approximately normal exposure and development and the use of suitable films.

The misleading statement has long persisted that to interpret the evidence of disease, one must know the appearance of the normal structures. This advice is much simpler than the preparation, because the appearance of normal structures is not constant but shows a variation so great that it is often difficult to distinguish it from pathologic changes. It is the normal range of anatomic variations which must be learned by extensive study of the extremes. The existing differences lie in anatomic landmarks, tooth form, bone types and localized peculiarities.

After structural variations have been recognized and identified, the changes resulting from abnormal function must be excluded from evidence of disease. Loss of function and trauma produce around teeth characteristic changes which are liable to be misinterpreted. Teeth which have had no occlusal opponents for a long period extrude and the periapical bone is affected by disuse atrophy. Similar but less marked manifestations occur around occluding teeth which are not vigorously used. Occlusal trauma in excess of the compensatory resistance of the alveolar process causes periapical bone destruction suggestive of infection. The effects of trauma can usually be differentiated from infection by the accompanying alteration in periodontal membrane, except in some instances of mandibular incisors and cuspids subjected to excessive stress in the direction of the longitudinal axes.

With structural peculiarities and the effects of perverted function excluded, interpretation is concentrated on evidence of disease. The advance in radiodontic interpretation should be principally in the discovery of incipient disease, which offers a favorable prospect for conservative treatment, although greater accuracy is needed in differentiating some of the advanced lesions. The evidence of early pathologic changes is usually found in the crest of the alveolar process, the periodontal membrane and the lamina dura, and the most careful inspection must be made of these structures in order to detect the first manifestations of disease. The beginning of periodontal destruction is evidenced by a slight disintegration in the crest of the interdental septums, the loss of the marginal lamina dura and a

general thickening of the periodontal membrane. The first evidence of periapical infection is the localized thickening of the periodontal membrane or a break in the lamina dura. Too much importance is attached to radiolucent areas and too little attention has been given to structural changes. Marked radiolucency may be caused by anatomic variations, and slight radiolucency may result from considerable involvement of the bone by disease.

The hallucinations regarding pulpless teeth have resulted in sins of commission in condemning harmless pulpless teeth and sins of omission in ignoring diseased vital teeth and periodontal sepsis. If the foramina of some pulpless teeth are sealed by dentin and cementum, if some pulpless teeth have been kept aseptic and if some pulpless teeth are not sufficiently virulent to produce disease, all pulpless teeth are not pathogenic. Radiodontia offers a means of discriminating in pulpless teeth to anyone who is more interested in disease than in bacteria.

Superficial economics and profound indolence have led to extreme conservation of pulps, many of which succumb to septic degeneration. These pulps respond to all vitality tests for months and perhaps years after they are diseased. They produce periapical infection and through circulatory connection cause metastatic infection, which constitute a greater risk than the average condition of pulpless teeth. The majority of degenerating pulps do not cause local symptoms and can be discovered only by radiodontic examinations. The early periapical changes are often subtle, requiring careful examination with accurate interpretation to distinguish the evidence.

Periodontal lesions even in advanced stages are quite generally disregarded as a source of systemic disturbance, yet they may be septic foci of greater significance than pulpless teeth. The antiquated theory that the drainage of pus prevents infection should be revised to the rational theory that the drainage of pus indicates a chronic infection which has overwhelmed the natural resistance and demands corrective treatment. The drainage is neither constant nor thorough, and if it were, why, since a chronic suppuration would not be tolerated elsewhere, should it be allowed to persist in the mouth? Radiodontic examination reveals the types of periodontoclasia which can be controlled by eliminating the etiologic factors and the pockets, and also the infiltrating type, which is rapidly progressive and indicates the removal of the teeth to conserve the alveolar process for denture stability. The septic crypts which develop around partially erupted mandibular third molars are seldom considered unless an acute exacerbation occurs. These are common foci existing without warning symptoms which can be diagnosed from radiodontic evidence.

The importance of caries in destruction of teeth and as the source of the pulpless tooth problem makes imperative more rigid inspection of the inaccessible locations where damage usually becomes serious before being discovered. Periodic radiodontic examination is the most efficient means of revealing caries in the approximal surfaces of teeth, at the cervical margins of approximal restorations and often in occlusal fissures. The evidence of caries is not so easily secured and interpreted as one might be led to believe. Different views of the teeth are required because advanced caries may be obscured in either profile or diagonal aspects. In the interpretation of carious decalcification, cervical radiolucency, inequalities of superimposition and irregularities of contour must be distinguished. In deciding

when excavation and repair are necessary, it should be assumed that decalcification has progressed farther than the apparent radiolucency and bacterial toxins have penetrated beyond the decalcified area.

Advanced interpretation implies a greater discrimination regarding the reliability of the evidence, keener perception of structural variations and better judgment of the significance of abnormalities. These, in combination with routine examinations, and a skilful technic will enhance the value of radiodontic service and eliminate many diagnostic perplexities.

DISCUSSION

Charles F. Chandler, Montgomery, Ala.: It is an indictment against our profession that such a large percentage of poor roentgenograms are used for diagnosis or attempted diagnosis. The reference to clairvoyant methods and so-called attempts to differentiate bacteria and determine the resistance of the patient by examining a dental roentgenogram is very timely, and these methods should be discouraged by reputable, conscientious dental diagnosticians. The superficial examination of good roentgenograms and the attempt to diagnose poor ones and use this interpretation in operating on patients is, as Dr. Simpson says, morally wrong and the operator is possibly legally liable for incompetence and mistreatment. We are given a very clear statement of changes not pathologic which are often diagnosed as disease, involving the loss of teeth which might be easily restored to normal function through correct interpretation and treatment. One of the most important points is the statement that "The advance in radiodontic interpretation should be principally in the discovery of incipient disease." Dr. Simpson gives us a nice interpretation of the diagnosis of pulpless teeth both good and bad, and also presents another dangerous condition, the infected vital pulp in the ultraconserved teeth. I regret that I have never been able to diagnose these diseased vital pulps until some tissue change has taken place. The reference to systemic disturbance in periodontal disease seems indisputable. The use of the roentgen rays for examination of areas of incipient decay, especially in approximal surfaces, is indispensable, and the only way that it can be found in many cases; and the same may be said of caries at cervical margins of approximal restorations, which cannot, as Dr. Simpson says, always be found with a single angle exposure. The roentgen rays often reveal salivary and serumal calculus after the teeth have supposedly had a thorough cleaning. The removal of the calculus often reveals an incipient stage of periodontia. In my practice, I find sixteen film exposures to be the minimum and add two posterior bite-wing films for the different angle. There can be no argument about the fact that "decalcification has progressed farther than the apparent radiolucency."

Theodor Blum, New York City: My interest in roentgenography developed as early as 1905, in New York, in the office of my brother, Richard Blum. Dental roentgenography was in its infancy, the machinery complicated. The tube stand was a simple wooden affair and the tube unprotected. Before every exposure, the vacuum had to be regulated and the tube itself tested with the fluoroscope in front of which one's hand was placed, and unfortunately always with the back of the hand facing the tube. No one was interested in details as we expect to observe them today. However, it did not take long to become interested and to realize the necessity and usefulness of the rays. As early as 1909 in a paper read before the James Truman Dental Society of the University of Pennsylvania, I expressed my opinion regarding roentgenography in a sentence, which read, "I feel certain even as an undergraduate that the time will come when the dentist will include the x-ray apparatus as a necessary adjunct to his dental office."[1] Dr. Simpson's paper is very timely. The paragraph about the study of the normal to understand the abnormal, as well as the next one, and particularly the words "the changes resulting from abnormal function must be excluded from evidence of disease," are not clearly enough expressed to be generally understood and their correctness depends on one's definition of the word "pathology." The remarks about the pulp test do not correspond with our experience as will be seen in reading a paper by my associates, Drs.

1. Blum, Theodor: Roentgen Rays in Dentistry, Pennsylvania Dent. J., March, 1909.

Reiss and Furedi, entitled: "Preliminary Report on the Significance of the Pulptester as Revealed in a Microscopic Study of the Pulps of 130 Teeth." Dr. Simpson says: "The majority of degenerating pulps do not cause local symptoms and can be discovered only by radiodontic examinations. In reply to which I wish to state that the evidence is revealed much earlier by the pulp test than by roentgenograms. It seems to me that most practitioners are not aware of the difficulties not only of taking roentgenograms, but also of interpreting them. There are very few in our profession and practically none in the medical profession who are thoroughly familiar with oral roentgenography. I am so much impressed with this fact that I have suggested in the past and still do suggest to the general practitioners that they send their new patients to oral diagnosticians for general roentgen-ray examinations as well as for pulp tests and transillumination. There are certain conditions found in the roentgenograms that few know about nor could know on account of the limited experience of most practitioners. The pulp test also is quite difficult. A second suggestion I wish to repeat regards the annual reexamination, which should include bite-wing films only of all vital teeth and regular films of devitalized teeth. We know entirely too little as yet about interpreting roentgenograms, and the only way to increase our knowledge is to combine a study of clinical evidence, roentgen-ray findings and histopathologic diagnosis. We can acquire the clearest knowledge by an intimate study of the very early changes noticeable on the film as well as in the mouth. This is particularly true of tumors the diagnosis of which is much easier when they are fully developed. To recognize or distinguish between root fragments and changes of the bone itself by means of the roentgen rays alone is sometimes impossible; another subject being studied now in our medical laboratory by a correlation of roentgenographic and histopathologic evidence in conjunction with surgery.[2]

2. Blum, Theodor: Clinical Oral Surgery, with Special Emphasis on Its Related Pathology, Part 3, J. Dent. Res., 10:337 (June) 1930; Pregnancy Tumors: A Study of Sixteen Cases, J.A.D.A., 18:393-410 (March) 1931; Tumors of Jaws, Dent. Cosmos, 73 (Aug.) 1931; Unusual Bone Cavities in Mandible, J.A.D.A., to be published.

PROPHYLAXIS AND PYORRHEA*

By THOMAS B. HARTZELL, M.D., D.D.S., Minneapolis, Minn.

"PROPHYLAXIS" comes from the Greek word which means "to guard." The word, in its commonly accepted sense today, is intended to imply the prevention of disease; or preventive treatment. Immunity to various forms of disease depends on many varying conditions. It is "the power which a living organism possesses to resist and overcome infection." It may exist as acquired immunity, which is due to a previous attack of the disease in question, as immunity to whooping cough or to measles, or to inoculation with the bacteria of the disease of their products.

Acquired immunity may be active or passive. Active immunity is brought about by the activity of the cells of an individual as a result of having had the disease in question or as a result of artificial inoculation with a modified or attenuated form of the causative organism. Active immunity is that which is conferred, on recovery, by a contagious disease.

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

There are, no doubt, a certain number of persons who remain throughout life comparatively immune to the ravages of pyorrhea. The number is comparatively small and the immunuity they possess depends apparently on absolutely perfect digestion, assimilation and elimination. Persons thus blessed resist all forms of disease to a marked degree. It is to be regretted that there is not a greater number of such people in the world.

Pyorrhea, or as it is sometimes called, periodontoclasia, has existed since the beginning of history. The embalmed bodies of the ancient Egyptians revealed to the researcher Sir Mark Armond Ruffer the fact that both pyorrhea and dental abscesses existed among these people many centuries prior to the Christian era. The disease will continue to exist many centuries from the present era; principally because the average human being does not understand why he is suffering from pyorrhea; oftentimes, does not know he is suffering from it; and the dental profession of today seems to be little interested in the prevention of pyorrhea; hence, my pessimistic view of the status of this disease, past, present and future.

Pyorrhea is the result of the activity of a heavy coat of germ life clinging to the sides and necks of human teeth. These bacteria dissolve the mucous membrane lining the gingival crevice, and cover the root sides of the teeth with a layer hundreds of individuals deep, organisms steadily dissolving their way into the deeper structures around the teeth, destroying the tooth attachment to the bone and the bone itself, and eventually dissecting out the tooth from the alveolar process, so that it may be lifted out with the fingers, or may drop out of its own weight.

The vitality, virility and reproductive power of these bacteria, principally streptococci and staphylococci, which cling to tooth sides depend, in a great measure, upon the food and digestive habits of the person affected. Persons whose digestion, assimilation and elimination are perfect suffer infinitely less from the ravages of the germ coats gathered on the necks of teeth than do persons whose digestive process is in any way interfered with or is in any way imperfect. Imperfect digestion produces a blood and saliva favorable to bacterial growth; whereas, perfect digestion tends to the reverse.

Recent studies of my own on this particular point prove to my satisfaction the fact that the bacterial life upon the tongue surface and between the papillae of the tongue furnishes a marked index of the power of the body or the immunizing forces of the body to resist bacterial invasion. Whenever the digestive process is imperfect, the death of the epithelium upon the tongue is more widespread or common and the accumulation and growth of destructive bacteria between the papillae and on the surfaces of the tongue is vastly increased; and the coating of the tongue which we see daily in the practice of dentistry is the result of this failing immunity to bacterial attack, the coat being composed of dead epithelium and billions of bacteria.

These bacteria upon the tongue are destructive to animals in much greater degree than are the bacteria clinging to tooth sides, and their absorption depresses the immunizing forces of the body, making it possible for greater and greater numbers of bacteria to exist on tooth sides than could or would exist if the digestive powers of the body were perfect. The odor of the breath of persons with coated tongues gives some index of the damaging quality of the bacterial life growing upon the tongue. The more objectionable the odor of the breath is, the

more deadly the bacterial poison being created there.

Therefore, any consideration of prophylaxis in the treatment or prevention of pyorrhea involves, first, the general health and the perfection or imperfection of the digestive powers; and where the digestive and eliminative processes are in any way abnormal, these abnormalities should be sought for and corrected. Secondly, local prophylaxis of the oral cavity, when intelligently practiced, can and will absolutely prevent bacterial destruction of the tissues of the teeth and their investing processes. A study of the bacterial life on the sides of teeth and on the surfaces of the tongue reveals the fact that they do possess this intensely destructive power, as regards both epithelium and enamel.

The obvious remedy, which is at hand and can be used by everyone, no matter how badly deranged his digestive functions may be, resolves itself into removal of all possible bacterial life from tooth sides and the tongue, at least twice a day, and the use of prophylactic remedies, which have the power to inhibit to some degree their reproductive power and, at the same time, to neutralize their damaging product, both their destructive ferments, which dissolve tissue cells, and their acid waste material, which decalcifies enamel. Oral prophylaxis should begin in the morning with a careful and gentle cleaning of the tongue surface, removing everything from the tongue and its papillary epithelium, which can readily be swept away.

For cleansing processes, no one has yet discovered anything more effective than soap, nor has anyone yet revealed to the medical or dental world any particular soap which is so valuable for oral prophylaxis as the soap made by boiling sodium hydrate and castor oil together, the technical name of which is sodium ricinoleate. This soap has the power to neutralize even the poison of tetanus,[1] rendering it harmless when injected into animals. No other soap has been discovered, nor has any other substance been discovered, with such a powerful detoxifying and deodorizing power as that of sodium ricinoleate. Therefore, in my own practice, I have my patients cleanse the tongue with a sodium ricinoleate product in which the taste of soap has been overcome, removing from the tongue everything that can be removed without irritating it, and saturating the interspaces between the papillae with the sodium ricinoleate product in either liquid or paste form. Then, proceeding to the teeth, they remove from the tooth sides as nearly as possible all the bacterial life which has accumulated there during the night. This may be done by leaning the toothbrush bristles against the crowns of the teeth and bending them down to the gum so that the sides of the bristles rest upon the gum, and when they are so resting on the gum, thrusting them in between the teeth with a strong vigorous motion which will make them slip in and out part way, thus disturbing, breaking up and detoxifying the bacterial coat on the tooth sides. This should be done both on the buccal and labial surfaces and on the lingual and interproximate surfaces as well.

If this operation is carried out successfully under the direction of a competent dentist, until the technic is mastered, and disclosing stain is applied to the sides of the teeth that have just been so treated, the bacterial coating of the night will be so effectively removed that disclosing stain will not reveal anything

1. Hartzell, T. B., and Larson, W. P.: Neutralization of Bacterial Toxin, J. A. D. A., 12:271 (March) 1925.

to the eye. A prophylactic treatment of this type morning and evening commenced when the gums and teeth are still in health will preserve them indefinitely. No bleeding of the gum edge can occur, because there are not enough bacteria on the tooth side at any time to destroy epithelium. No cavities can occur, because there are not enough bacteria at any time in any one spot on teeth to furnish the waste material or acid which will decalcify enamel. Thirty years of observation has proved this to me beyond shadow of a doubt.

710 Physicians & Surgeons Building.

DISCUSSION

Russell W. Bunting, Ann Arbor, Mich.: Dr. Hartzell has painted a picture of pyorrhea alveolaris as if it were purely a simple infective process located in the peridental soft and hard tissues. To many, this concept is quite unacceptable as also is his statement that he is able to prevent and cure pyorrhea solely by the reduction of bacterial overgrowths in the mouth. Yet I believe that everyone who has visited Dr. Hartzell in his office has seen many cases in which the mouths are apparently quite healthy and which have been treated according to the principles which are laid down in this paper. When we consider the number of factors which are involved in the disease known as pyorrhea, including the local traumatic and infective stresses and the integrity and vital resistance of the alveolar structures, we may well wonder how the removal of one factor, namely, the bacterial, can alone effect a cure of this complex disease. There are those who believe that bacteria are purely secondary in their importance as factors in this condition and that atrophic and degenerative changes in the alveolar process are much more significant; that is, they place the burden of responsibility for the production of the disease wholly on constitutional factors which influence the inherent metabolism and health of the supporting tissues. It is rather difficult to reconcile these two points of view and, in fact, it is seemingly impossible for most clinicians and scientific investigators of the disease to get on any common ground. Interesting as these viewpoints may be, the fact remains that many clinical workers have seen a definite metamorphosis in oral tissues from a condition of disease and pathologic state to that of apparent health and permanent freedom from disease which apparently has resulted from prophylactic methods quite similar to those which Dr. Hartzell has described. To them, the clinical evidence is incontrovertible. In view of these observations, there is only one conclusion that we can draw; namely, that, in the process of reducing the infective overgrowths in the mouth, dental calculi and other sources of local trauma not mentioned by Dr. Hartzell are also removed; which results in reduction to a minimum of the traumatic and infective stresses which have militated against the health of these oral tissues. At the same time, by the use of the toothbrush and the establishment of better hygienic conditions in the mouth, the circulation of the peridental tissues has been greatly improved, and thereby the resistance of these tissues against infective invasion has been increased. Therefore, when Dr. Hartzell speaks of the treatment and prevention of peridental disease by the reduction of bacterial overgrowths, he necessarily automatically includes several other prophylactic conditions which, at the same time, are put into effect; namely, the reduction of traumatic as well as infective stresses and the increase of the resistance of the peridental tissues themselves. It is only in this manner that we are able to explain the general beneficial results which we personally have observed, which have occurred as a result of the establishment of optimum hygienic conditions in the mouths of a large number of patients over a period of twenty years or more. Explain it as we may, the fact remains that the establishment and maintenance of a condition of strict oral hygiene is the most effective means of controlling peridental disease that is known today.

Edward L. Ball, Cincinnati, Ohio: Practiced in any dental office, periodontia spells success. To get the tooth and its surrounding structures healthy before reconstruction and keeping these tissues healthy is fundamental. The structure of any house depends on its foundation, and, seemingly, it is here that we fail in operative dentistry. Let us elaborate on some striking sentences in Dr. Hartzell's paper: "The dental profession of today seems to be little interested in the prevention of pyorrhea." There is an element of truth in this statement, and yet there is an increasing number of general practitioners who realize

that the only solution of this problem is to be found in prevention. Last week, at the round table discussion of the American Academy of Periodontology, this question was asked: In what way can the Academy aid in promoting greater interest in periodontia? The group around this table gave the following answers: 1. Establish a public relations committee. 2. The journals should publish articles on periodontia frequently. 3. Bring before the public the message that pyorrhea is curable. 4. The suggestion should be made to state and local societies that papers and clinics on periodontia be included in their programs. 5. Every practitioner should be invited to the periodontia meetings. This has all been done for creating interest in periodontia, especially in its preventive aspects. In the statement, "Persons whose digestion, assimilation and elimination are perfect suffer infinitely less from the ravages of the germ coats gathered upon the necks of teeth than do persons whose digestive process is in any way interfered with," is a most important suggestion for mouth health. Constipation is indeed a factor in the health of any tissue of the body, especially the mouth. Dr. Hartzell mentions the bacterial life upon the tongue surface. Possibly we have overlooked this part of the oral cavity too long. Our old family doctor was probably right when he asked for a spoon and said, "Let me see your tongue," and then ordered calomel to correct elimination. As to the cleaning of the tongue, how many of us do this or instruct our patients to do so? Another interesting thought is presented in the following lines: "The obvious remedy, which is at hand and can be used by every one, no matter how badly deranged his digestive functions may be, resolves itself into the removal of all possible bacterial life from tooth sides and the tongue, at least twice a day, and the use of prophylactic remedies." It has been clearly demonstrated that bacteria play a most important rôle in periodontia, not alone on the tooth surfaces, but also in the tissues surrounding the tooth. About ten years ago, Austin F. James of Chicago told me that his failures in periodontia were not so much in his operative skill as in his ability to teach his patients the care of the mouth. In my practice, I too find this is more difficult. I use the Charters' method of brushing, showing the patient the technic on a model, and then brush his teeth for him, instructing him as to the proper use of toothpicks for cleaning interproximal spaces, and I then ask him to repeat the procedure before I dismiss him. The importance of this care is emphasized to the patient at every visit, but, many times, we must admit failure. The education of a patient in mouth care is unending—if we give up we are lost. A young physician, a patient of mine, realizes the lack of preoperative diagnosis and treatment of the periodontal tissues, the causative condition in the disease of his gum tissue, alveolar process and tooth structure. Three years ago, he spent $400 on inlays and a small bridge. The operative work was beautifully done. At that time, he gave a history of Vincent's infection, which had been temporarily arrested. Since then, he had had repeated attacks of this infection and repeated treatment by scaling, etc., and, after each treatment, he had a definite systemic reaction. When the patient presented himself to me, the roentgenograms revealed alveolar absorption, interproximal caries and caries at the base of the inlays. The clinical examination verifies the roentgenographic findings, but revealed no evidence of gingival ulceration. The interproximal papillae were thickened, with a separation between the buccal and lingual surfaces. The color of the gum was fair, but blood could be pressed from interproximal areas. Vincent's organisms could be demonstrated at any time. These areas were not made cleanable three years ago, so that daily prophylactic care would be effective. The following procedure was followed: Preoperative prophylaxis and other treatment were given during the week prior to operation, which was as follows: The gum tissue was excised to the bottom of the pockets, the alveolar process was curetted and smoothed, the root surfaces were carefully scaled and polished, daily home care was outlined and the patient was instructed to return at regular intervals. He was advised to have the cavities filled as soon as the condition of the periodontal tissues warranted it. This procedure should have been done three years ago. To summarize: 1. The teeth and the investing tissues must be put in as healthy condition as is possible. 2. Operative and reconstructional dentistry should be properly taken care of. 3. The patient should be instructed in home care and advised to come in oftener for prophylactic care and observation. If this be done, there is no question that better and healthier mouths will be the end-result.

Dr. Hartzell: To some of you it may seem that a paper on prophylaxis and pyorrhea in

a section devoted to operative dentistry might be out of place. I assure you that nothing is more important to the operative dentist than the health of the foundations upon which he builds his structures. What use is it to repair teeth if the foundations on which they rest are not in normal health? It is like building a house upon the sand. It is incumbent on the operative dentist to look closely to the health of the tissues of the teeth on which he performs his operation. Not long since, it became my duty to lift out of their sockets two fine molars in which well-made gold inlays had been placed. The latter served their purpose in repairing the crowns of those teeth just two months, at the end of which time the teeth had continued to loosen to a degree which made them absolutely useless to the patient, and the gold inlays and the teeth both were lifted out with thumb and finger. This is an exaggerated example of conservation of tooth crown when the foundation carrying the tooth crown was gone. I cannot emphasize too vigorously the fact that the destruction of the alveolar process around teeth, no matter what their age may be, is to a large degree a matter of bacteria. If the sides of teeth are maintained comparatively free from a heavy coat of destructive micro-organisms, the foundations of those teeth will remain intact until the end of life. I have observed in my own practice a considerable number of cases in which the teeth have done service for from sixty to seventy years. This is unusual, but it depends on the high degree of intelligence of the person who possesses these teeth and the fact that in early life he had been trained in the care of the sides of his teeth to secure cleanliness and freedom from bacterial life, the destructive power which increases the depth of the pocket and creates ulcers and also is responsible for most of the cavity formation in the crown. To epitomize my knowledge of this matter I would say, "Employ every endeavor to remove the bacterial life which constantly recurs on the sides of the teeth, using substances which will inhibit them and detoxify the growth. Pay special attention to the condition of the tongue because it is an index of the condition of the digestive apparatus. Whenever the tongue shows a yellowish or brown coat, we may know that digestion has been interfered with. That yellowish and brown coat is made up of living bacteria and dead epithelium, which, if ingested, increases the digestive fault and correspondingly increases or permits the increase of bacterial growth in the oral cavity, a growth which is the great destructive force which we must deal with primarily if we are to succeed in maintaining reasonable health of the teeth and their supporting structures as well as health of the whole body." And, I might add, most of the halitosis which we meet among our patients comes from the putrefaction of tongue surface epithelium.

PRELIMINARY STUDIES ON THE IMMUNOLOGY OF DENTAL CARIES*

By PHILIP JAY, M.S., D.D.S.; MARY CROWLEY, M.S., and RUSSELL W. BUNTING, D.D.Sc., Ann Arbor, Mich.

FROM time to time, we have reported the constant presence of *Bacillus acidophilus* in dental caries. We have repeatedly shown that if this organism is demonstrable at all in mouths free of dental caries, it is as a rule transient, and it has not been isolated from such a mouth consistently.[1] It was also observed that, in very young patients, the organism can be isolated from the surface of the teeth three months prior

*Work done under grant from the children's fund of Michigan research laboratories, School of Dentistry, University of Michigan.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

1. Jay, Philip, and Voorhees, R. S.: Bacteriology of Dental Caries with Special Reference to Bacillus Acidophilus, J.A.D.A., 16: 2054 (Nov.) 1929.

to the clinical manifestation of the disease.[2] One of us (R. W. B.) has succeeded in producing carious-like lesions in human teeth *in vivo* by applying *Bacillus acidophilus* culture to the surface of the tooth by means of a mechanical appliance.[3]

It was reported by one of us[4] that the incidence of dental caries was significantly reduced in a large number of children by a well-fortified diet low in sugar, and, though not reported at the time, it was observed that the incidence of *Bacillus acidophilus* was prominently reduced. In view of our own work, as well as the work of others,[5] it is our belief that *Bacillus acidophilus* must be seriously regarded as an etiologic factor in dental caries. Still, it is difficult to think of dental caries as an infectious disease in the ordinary sense. It is not due to a true toxin, and the resulting systemic ramifications of dental caries can be considered secondary to the initial decalcification and disintegration of the tooth substance. In the control of dental caries, we are dealing with the elimination of an organism rather than with the neutralization of a true toxin. Hence, from an immunologic standpoint, the problem is unique and its solution is uncertain.

TABLE 1.—SKIN REACTIONS
(Unpurified Filtrate)

Number of Persons	Oral B. Acidophilus	Skin Reactions
10	+	+
3	+	—
1	+	Doubtful
4	—	—

For the study to be reported here, a filtrate was prepared from forty oral strains of *Bacillus acidophilus* isolated from cases of dental caries. These strains were grown separately in 1 per cent glucose-meat infusion broth p_H 7.0 at 37.5 C. for from six to ten days. At the end of the incubation period, the cultures were pooled, and filtered through a Berkefeld (N) candle. It was observed that 0.1 c.c of diluted filtrate introduced intradermally provoked definite cutaneous reactions in certain persons. (Fig. 1.) This reaction, characterized by a localized area of erythema from 10 to 30 mm. in diameter, usually appeared within from eight to ten hours after inoculation and persisted for from three to twenty-four hours. Sterile uninoculated broth failed to produce skin reactions, and positive skin tests were not observed in rabbits, guinea-pigs, or white mice.

TABLE 2.—SKIN REACTIONS
(Purified Filtrate)

Number of Persons	Oral B. Acidophilus	Skin Reactions
63	+	+
7	+	—
4	+	Doubtful
5	—	+
6	—	Doubtful
1	—	—

As indicated in Table 1, there seemed in the first group tested to be some inclination on the part of persons whose mouths harbored *Bacillus acidophilus* to react locally to the intradermal introduction of the unpurified filtrate; whereas,

2. Jay, Philip, and Voorhees, R. S.: Bacillus Acidophilus and Dental Caries, Dent. Cosmos, 69:977 (Oct.) 1927.

3. Bunting, R. W.; Nickerson, Gail, and Hard, Dorothy G.: Further Studies of Relation of Bacillus Acidophilus to Dental Caries, Dent. Cosmos, 68:931 (Oct.) 1926.

4. Bunting, R. W., et al.: Problem of Dental Caries, Am. J. Dis. Child., 40:536 (Sept.) 1930.

5. Rodriguez, F. E.: Studies of Specific Bacteriology of Dental Caries, Mil. Dent. J., 5: 199 (Dec.) 1922. McIntosh, James; James, W. W., Lazarus-Barlow, P.: Investigation into Etiology of Dental Caries, Brit. Dent. J., 43:728 (Aug. 1) 1922.

the four persons free from *Bacillus acidophilus* gave negative skin reactions.

A larger group was similarly tested with a filtrate in which the nitrogen had been considerably reduced. The filtrate was purified by precipitation with slightly acidified alcohol. The resultant precipitate was dissolved in physiologic sodium chlorid solution and refiltered. The results of the skin tests with this substance are listed in Table 2. It will be noticed that the relation between the skin reaction and the presence of *Bacillus acidophilus* was less specific when the purified filtrate was used.

To determine further the possible significance of these skin reactions, the following procedure was undertaken: Twelve persons ranging in age from 12 to 30 years, all more or less actively susceptible to dental caries, were selected for the experiment. All of these subjects reacted positively to the purified *B. acidophilus* filtrate, and cultures taken from the teeth were positive for *B. acidophilus*. One-half of this group received periodic subcutaneous injections of the purified filtrate. After an initial injection of 0.1 c.c., the dose was increased by 0.2 c.c. every week until, at the end of the seventh week, the maximum inoculation of 1.5 c.c. had been given. The patients experienced no discomfort during this course of treatment, the filtrate being readily absorbed in each case. The remaining six were observed as controls.

TABLE 3.—SUBCUTANEOUS INOCULATION OF PURIFIED FILTRATE

Patient	Skin Reaction 1/30/31 Mm.	Inoculations 2/6	2/13	2/20	2/27	3/6	3/13	3/20	3/27 C.c.	Skin Reaction 4/10/31 M.m.
C. B.	17x13	0.1	0.2	0.4	0.6	0.8	1.0	1.25	1.5	15x12
R. H.	21x21	0.1	0.2	0.4	0.6	0.8	1.0	1.25	1.5	23x16
V. B.	29x16	0.1	0.2	0.4	0.6	0.8	1.0	1.25	1.5	30x22
M. F.	19x14	0.1	0.2	0.4	0.6	0.8	1.0	1.25	1.5	22x16
D. H.	22x18	0.1	0.2	0.4	0.6	0.8	1.0	1.25	1.5	32x22
H. I.	23x17	0.1	0.2	0.4	0.6	0.8	1.0	1.25	1.5	19x22
					CONTROLS					
R. H.	17x15	0	0	0	0	0	0	0	0	21x21
E. G.	16x13	0	0	0	0	0	0	0	0	14x14
D. P.	22x19	0	0	0	0	0	0	0	0	32x23
M. P.	16x16	0	0	0	0	0	0	0	0	23x20
M. B.	23x19	0	0	0	0	0	0	0	0	28x28
M. G.	19x15	0	0	0	0	0	0	0	0	20x20

TABLE 4.—SUBCUTANEOUS INOCULATION OF VACCINE

Patient	Skin Reaction 4/28/31 M.m	Inoculations 6/9	6/15	6/20 C.c.	6/25	Skin Reaction 8/4/31 Mm.
G. E.	25x20	0.2	0.4	0.8	1.2	22x22
J. D.	28x20	0.2	0.4	0.8	1.2	0*
E. S.	20x13	0.2	0.4	0.8	1.2	0*
E. C.	20x15	0.2	0.4	0.8	1.2	25x20
H. A.	25x15	0.2	0.4	0.8	1.2	24x18

*Negative skin reaction.

Two weeks after the final inoculation, the entire group was given 0.1 c.c. of the purified filtrate intradermally in order to determine whether the skin reactivity to *B. acidophilus* had been influenced by such treatment. (Table 3.) The final skin tests were positive in all cases, and mouth cultures taken at that time were positive for *Bacillus acidophilus*. The skin reactions were positive when tested again two months later. It was taken for granted from this experiment that this filtrate, which was low in nitrogen and which resembled a carbohydrate in other respects, did not contain the antigenic fraction of the bacillus.

The experiment was repeated, this time with a suspension of heat killed *Bacillus acidophilus* culture. The same forty strains were grown for five days on casein digest sodium oleate-agar at 37.5 C. The growth was recovered in 0.85 per cent sodium chlorid solution and passed through a glass wool filter. The suspension was diluted so that 1 c.c. contained 300,000,000 organisms. After heating at 57.5 C., for one hour and a half, 0.3 per cent tricresol was added, and suitable tests, which included animal inoculations, were carried out to insure sterility and safety. Ten girls between the ages of 10 and 15, all of whom responded positively to the intradermal injections of the purified filtrate, were selected for this study. One-half of the group received the vaccine and the remainder were observed as controls. After an initial 0.2 c.c. inoculation, it was our intention to double the dose every five days until a maximum dose of approximately 1.5 c.c. should be given. The inoculations were made subcutaneously in the deltoid region of the arm as before, but the resulting reactions this time were quite different.

When seen five days after the 1.2 c.c. injection, two of the patients had very definite reactions. Each presented an area about 12 mm. in diameter at the site of inoculation, purple, raised and distinctly indurated. (Figs. 2-3.) They experienced no systemic discomfort whatsoever. There was no fever and the tenderness was limited to the immediate proximity of the lesion itself. After a few days, the centers became excoriated, emitting a serous discharge which persisted for two or three days, after which the induration gradually became less apparent. At no time were the axillary glands involved. At the end of four weeks, the lesions had practically healed except for a slight discoloration, and a little induration.

TABLE 5.—B. ACIDOPHILUS AGGLUTINATION

Culture	Serum	Dilutions					Control
		1:20	1:40	1:80	1:160	1:320	
Vaccine	J. D.	+	+	+	+	−	−
Vaccine	E. S.	+	+	+	+	+	−
Vaccine	E. C.	±	±	−	−	−	−
39M*	J. D.	+	+	+	+	−	−
39M*	E. S.	+	+	+	+	+	−
39M*	E. C.	−	−	−	−	−	−

*Strain of B. acidophilus not included in vaccine.

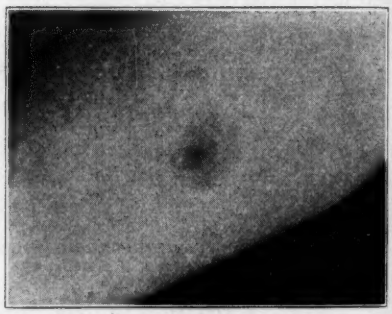


Fig. 1.—Positive skin reaction eight hours after intradermal injection of 0.1 c.c. of the purified B. acidophilus filtrate.

Of greater interest is the curious fact that after the larger 1.2 c.c. dose had been administered, the site of the previous 0.8 c.c. injection in the opposite arm became similarly affected. Arthus[6] had made a similar observation on giving rabbits repeated subcutaneous injections of sterile horse serum.

Because of the severity of the reaction, we considered it unwise to administer additional vaccine and contented ourselves with giving the final skin tests to the entire group at this stage. Again, the purified filtrate was injected intradermally and readings were made ten hours later. (Table 4.)

Fig. 2.—Appearance of arm five days after subcutaneous injection of 1.2 c.c. of B. acidophilus vaccine.

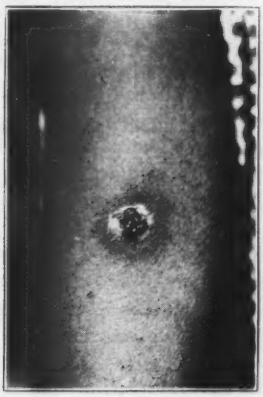


Fig. 3.—Appearance of arm eight days after subcutaneous injection of 1.2 c.c. of B. acidophilus vaccine.

This time, all remained positive, with the exception of the two who had the severe reactions described above. One of the control group presented an extremely doubtful reaction also, for which we have no explanation. We were able to obtain blood from the two girls in whom the reactions had become negative after the treatment (J. D. and E. S.), as well as from one other (E. C.) who had remained positive despite the vaccination. Serum was prepared in the usual way and tests for *Bacillus acidophilus* agglutinins were made. As will be seen in Table 5, the two who gave negative skin reactions, (J.D. and E.S.) had higher titers than the serum of E. C. In fact, the agglutination in the latter was barely perceptible. It will also be noticed that a strain of *Bacillus acidophilus* (39M) which was not included in the vaccine was agglutinated by the serum of J. D. and E. S. but not that of E. C. In these two cases, the skin sensitivity to *Bacillus acidophilus* filtrate disappeared with the production of *Bacillus acidophilus* agglutinins in the blood stream.

6. Arthus, A.: Compt. rend Soc. de biol., 55:817, 1930.

CONCLUSION

This opens up a very interesting field for further investigation. As the study progresses, we will determine the length

of time the agglutinins persist in the blood. This, in turn, will be checked up with the skin reactivity and the possible effect, if any, of these phenomena on the welfare of *Bacillus acidophilus* in the mouth. A search will be made for *B. acidophilus* agglutinins in the blood of persons who are naturally immune to dental caries. It is very possible that this procedure may ultimately lead to further clues as to the significance of *Bacillus acidophilus* in dental caries.

SUMMARY

A skin reactive substance was observed in *Bacillus acidophilus* filtrate.

It was observed that the purified filtrate, which resembled a carbohydrate, contained the skin reactive substance, but was not antigenic as determined by the skin test.

In two instances, negative skin reactions were associated with *B. acidophilus* agglutinins in the blood serum after the use of a polyvalent *B. acidophilus* vaccine.

THE IMPORT OF CHILDREN'S DENTISTRY*

By F. BLAINE RHOBOTHAM, D.D.S., F.A.C.D., Chicago, Ill.

AN adequate picture of children's dentistry has never been drawn. Earnest efforts to present the subject have been made here and there, but dental literature is wofully in need of a comprehensive correlation of the known facts and indeed an intensive further study of those phases of the specialty which have not been thoroughly scrutinized.

It is the purpose of this paper to suggest, in outline, the subject matter included, the opportunities offered and the obligation of the profession in this important field of dentistry.

EMBRYOLOGY

Research in orthodontia has contributed more to the knowledge of embryology perhaps than has any other branch of dentistry, yet, from the standpoint of prevention, the possibilities are unlimited, and the study is only begun.

DIET

Our literature on diet as it is related to tooth and bone formation and development is not clear. The subject of food supply and environment for the normal growth of the deciduous teeth is largely limited to the last five months of intrauterine life, while that of the permanent teeth is confined primarily to the first few years after birth. The normal bony development is influenced by so many conditions during childhood that it requires separate and most careful study.

There is no doubt that the influence of the vitamins, ultraviolet rays and internal secretions has been overestimated in many instances and underestimated in others. There is need for more facts and fewer fads. Certainly, we should urge more sanity, more conservatism and more research.

In view of the fact that we cannot

*Read before the Section on Partial Denture Prosthesis at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

divorce the oral structures from the rest of the body, it is apparent that the whole must be considered when making decisions regarding diet. Therefore, the medical and dental professions must work in harmony if the best is to be hoped for.

CHILD MANAGEMENT

Under child management falls the study of psychology, behaviorism and all of the problems of practice management that are concerned with getting on with the young patient. To be practical, a definite system must be worked out to meet every situation that may arise, in such a manner that efficiency will prevail. Unless this is accomplished, the practice becomes a failure because of economic conditions. No doubt, one of the reasons that children's dentistry is not more popular with dentists lies in this fact. There are a sufficient number of dentists who have definitely solved this problem to prove that it is not an insurmountable barrier.

HABITS

Splendid work has been done in the early detection and correction of habits that result in malocclusion of the teeth and in facial deformitiy. The profession as a whole has not been careful enough in regard to diagnosis, and is not so informed as it could be in regard to methods of correction. It would seem most effective to examine the very young patient early and often. At these regular appointments, the following at least should be checked: thumb sucking, cheek sucking, tongue biting, tongue pressure, mouth breathing and sleeping habits. Most of these habits can be corrected early, yet we generally see the patient after much damage has been done.

OPERATIVE DENTISTRY

In the field of operative dentistry, we are for many reasons called on to operate on both deciduous teeth and permanent teeth during the most difficult period. The deciduous teeth are in a constant process of change. Therefore, it is next to impossible, without roentgenograms, to determine the size of the pulp chamber or the state of development or absorption of the roots. "Extension for prevention" as regards cavity preparation in young permanent teeth is not always safe or advisable. Extra care must be taken to avoid unnecessary irritation to the pulp of permanent teeth through large metallic fillings.

Perhaps one of the most common errors in operative dentistry for young patients lies in failure to restore the hypoplastic first permanent molar to its anatomic form and size. Unless this is done, there is a marked tendency toward malocclusion and a closed bite. If seen early, the undersized first permanent molar may be built up to normal with cast gold overlays and, in extreme cases, even gold crowns are indicated. In the latter case, they may be replaced by porcelain jacket crowns when the patient has reached the age of from 16 to 20 years.

PROSTHETIC DENTISTRY

Prosthetic dentistry has been most sadly neglected, for indeed there are many indications for it in the care of children's teeth. In view of the fact that a large percentage of cases of malocclusion are directly traceable to the premature loss of deciduous teeth, too much cannot be said of the importance of mechanical space maintenance in such cases.

There are many appliances for the correction of habits that may lead to facial deformities, each of which may prove of invaluable service during childhood. For the correction or prevention of speech defects resulting from the early loss of the anterior deciduous teeth (from 18

months to 4 years), there is nothing quite so effective as a fixed bridge. There is also a large field for partial dentures, and several cases have been reported in which full dentures have been successfully used.

THERAPEUTICS

There has been so little study made of the histology of the deciduous pulp that its treatment is largely empiric. In deciduous molars, it is very difficult to distinguish between hypertrophied pulp tissue, hypertrophied gum tissue and vital pulp tissue which is pathologic. As a result of faulty diagnoses, treatment of these teeth is frequently unsuccessful. There are two grave and very common errors made by our profession generally: 1. Many teeth are unnecessarily sacriced too early, malocclusions resulting in many cases. 2. Many pathologic conditions are permitted to exist, particularly in cases which are not painful.

Root canal filling in young permanent teeth is most difficult, yet a sufficient number of pulpotomies have been performed to indicate that the treatment is reasonably successful in selected cases.

Many constitutional disorders are reflected in the mouth, which therefore offers a fertile field for the early discovery of general as well as local disorders.

Although severe cases of scurvy are rarely seen, mild cases are more or less frequent during childhood, and the careful diagnostician may render a most valuable service by its early detection. In cases of long standing, there may be serious sequelae in the growing vital organs, as well as a general local breaking down of the pericemental tissues. I have seen many cases of true periodontoclasia brought about by mild scurvy causing heavy deposits of serumal calculus in children as young as 12 years. The etiology of many cases of pyorrhea alveolaris harks back to childhood, in the case of the soft tissues, as well as the many types of traumatic and faulty occlusion resulting from neglect during childhood.

Anemia may also be detected in the mucosa of the mouth long before any other symptoms are apparent.

ANESTHESIA

Anesthesia is indicated so frequently during the childhood period that a thorough knowledge of it is necessary.

The so-called topical or surface anesthetics have a wide field. They should be used for the extraction of very loose deciduous teeth; prior to the injection of infiltratives; for fitting bands or matrices, and for painful scalings, such as may be indicated in the treatment of Vincent's infection.

Conductive or regional anesthesia is rarely indicated during childhood. Infiltration may be used quite generally, because of the lack of density of the bone in young persons. Two precautions should be taken: (1) there should be a period of at least three minutes between injection and operation and (2) every refinement of technic should be employed to avoid physical pain and to allay mental fears.

Nitrous oxid appears to be the ideal general anesthetic, as it can be given rather freely without unfavorable reactions. In very young patients suffering from thyroid disturbances, it is contraindicated, there being a sufficient number of fatalities on record to act as a warning.

EXTRACTION

There is no mistake that has been made more frequently than that of careless extraction of baby teeth. Children have often been ruined as dental patients because of painful extractions. The removal of a deciduous molar several years

before its roots have been normally absorbed is not a simple operation. Anesthesia is always indicated. The removal of lower deciduous molars may be greatly simplified by the bifurcation of the roots with a fissure bur, the extraction being performed with elevators. Extraction of the upper deciduous molar may be most easily accomplished by cutting off the lingual root with a fissure bur, extracting the mesiobuccal and distobuccal roots along with the crown portion with forceps and, finally, using an elevator or small root forceps for the lingual root.

Ankylosis of deciduous molars (usually the so-called submerged type), which is not uncommon, usually requires the services of a specialist.

MINOR ORAL SURGERY

Time will permit of the mention of only the three most common indications for minor surgery during childhood. The abnormal attachment of the superior labial frenum may result in a permanent separation of the permanent upper central incisors or may later interfere with the comfortable wearing of artificial dentures. It requires much experience to predetermine the operative cases. One is liable to neglect the imperative cases or to become too eager to operate in every case.

Unerupted permanent cuspids that are out of position may be caused to erupt more nearly normally by the surgical removal of the bone in the direction that we wish the tooth to move. The technic is not difficult to acquire, but it should be applied within a few years after the normal eruptive period of the tooth if it is to be most effective.

First permanent molars that are impacted under the distal portion of second deciduous molars may be induced to erupt by cutting downward to uncover their entire occlusal surface, followed by grinding away of the distal portion of the deciduous molar sufficiently to free it.

PATHOLOGY

The relationship between focal infection in the mouth and its sequelae which are manifested elsewhere in the body has been widely discussed in dental literature, but it has been almost exclusively limited to the adult period. In fact, it is necessary to go into the daily practices of the pediatric physicians to learn, first hand, of their experiences with focal infection during childhood. Because of the less dense arrangement of the bones during childhood and the freer circulation, it is possible for infections to spread rapidly. It is most interesting to study full mouth roentgenograms of children. In my experience with many thousands of cases, I would say that there is an average of three infected areas per child, in the United States, between the ages of 4 and 15 years.

The most common disorders associated with these focal infections are: heart disease, nephritis, rheumatism, arthritis, anemia and general debility. In hundreds of cases, I have seen complete recovery or improvement. Regardless of any differences of opinion as to just to what extent we can prove the theory of focal infection, this much cannot be successfully contradicted: The streptococcus and the staphylococcus, the two most commonly found bacteria in areas of infection, are deadly enemies of their host, not only because of their direct attacks but also because of the deadly toxins they are constantly throwing off. There is no place in the body where their presence is tolerated so commonly as in the mouth. In recent years, our profession has been making rather a concentrated effort to clean up the mouths of adults, but nowhere has

there been sufficient cognizance given the dire conditions in the mouths of children.

Medical literature points out that tuberculosis of the glands in the neck is usually the result of the infective organisms gaining entrance through a hollow deciduous tooth or roots. As stated previously, one of the most common errors in judgment during the childhood period lies in permitting infected baby teeth or roots, as long as they are not painful, to remain as space maintainers. It is evident that one can afford to sacrifice even beauty for health; and in view of the fact that space may be maintained mechanically, even symmetry may be preserved.

There has been a feeling that the care of children's teeth means an economic loss. That can only be true if one's conception of children's dentistry is confined to placing cement fillings and performing minor extractions. When a broader view is taken, it presents a field of service which requires the greatest diagnostic and technical ability. For such service adequately performed, there will be found an appreciative clientele willing to compensate for all of the difficulties and the exactness that true preventive dentistry involves.

In reviewing this meager outline of the import of children's dentistry, I trust that attention has been directed to the wide field that it encompasses. It includes embryology, diet, child management, study of habits, operative dentistry, prosthetic dentistry, therapeutics, anesthesia, extraction, minor oral surgery and pathology. All of these phases are intimately asociated with the permanent as with the deciduous teeth. It deals with the normal development of the jaws and face. It is concerned with general health problems as they may be affected by oral impairment. It presents opportunities to practice preventive dentistry at the most effective period. Neglect in childhood often spells opportunity forever lost.

The truth of the foregoing statement directs our attention to our obligation to children. Our profession can and must meet this obligation.

How are we to meet it? By increasing requirements in children's dentistry in our dental schools; by encouraging research in this field, and by developing the interest of the entire profession in this subject.

Children's dentistry is the only possible avenue through which we may hope to meet our obligation successfully, for childhood alone offers the opportunity for real preventive dentistry.

The public is quick to appreciate values in service and will reward us according to our worth.

CHILDREN'S DENTISTRY AT THE EIGHTH INTERNATIONAL DENTAL CONGRESS; THE ORGANIZATION OF CHILDREN'S DENTAL CLINICS IN EUROPE*

By HARVEY J. BURKHART, D.D.S., LL.D., Rochester, N. Y.

THE sessions of the Eighth International Dental Congress began on Monday, August 3, in the Grand Palais, Paris. It is one of the finest exposition buildings in the world, and the facilities for staging the literary and section programs and the housing of exhibits are the best and most suitable for our purposes of all those offered by any city of which I have knowledge.

While numerically the attendance was not nearly so large as that of congresses held in this country or even meetings of the American Dental Association, it was a most interesting gathering, as there were prominent representatives of the profession from many countries and nations. An excellent opportunity was afforded for an exchange of views and ideas and the making of acquaintances of men who have done worth-while work in the various branches of the profession. There was ample room in the Grand Palais for the various section meetings, which were thus held under much better auspices than we are accustomed to in this country, where these meetings are held in hotels or auditoriums. The arrangements for the various exhibits and for the illustration of papers was excellent.

My particular interest was in the oral hygiene and children's dental section. The oral hygiene exhibits from the various countries of Europe were quite extensive and elaborate. From Sweden, there was an exhibit of photographs of the school dental department at Gothenburg, where definite effort has been made to eliminate fearsome surroundings.

There were interesting drawings executed by primary school children in Geneva, Switzerland, and photographs of irregularities of the teeth and their treatment, fashioning a colorful panorama of the children's conception of hygiene, was presented by Dr. Farrand of France, who was the originator of the oral hygiene exhibits.

Mr. H. S. Bompas, a representative of the Dental Board of Great Britain, presented a display of the efforts which are being made to enlighten the laity in Great Britain with reference to the evils of dental disease. The London County Council and the School Dentist Society also showed interesting statistics of their work. Mr. Shipway presented a collection of photographs and diagrams, illustrating the spread of industrial dental clinics. Norway had a most excellent display, showing what Dr. Schiots' school breakfast has done to lessen the incidence of dental caries. My old friend, Dr. Johan Brun, was exceedingly busy, demonstrating the diets suitable to the various needs of children. Dr. Thomson and Dr. Conboy very ably represented Canada,

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

showing the successful manner in which oral hygiene campaigns have been successfully carried on in that country. Many very interesting and effective charts, posters and booklets used in demonstrating preventive dentistry in Germany, the work of Dr. Konrad Cohn, were very much admired. There was also a very interesting display from Holland, by Dr. J. S. Bruske, chairman of the Hygiene Commission, and from Finland and from Luxembourg, with photographs of dental clinics, toothbrush drills, instructions in oral hygiene, etc.

Dr. George H. Wandel had an exhibition showing the accomplishments of the American Dental Association. This exhibit was splendidly arranged and received wide and favorable comment.

SECTION MEETINGS

The section meetings devoted to a discussion of oral hygiene and children's dentistry were very well attended and a great deal of enthusiasm was displayed. Several persons who have been prominent in this work in the United States were present and took a prominent part in presenting papers and in the discussions.

It was a matter of considerable surprise to many of those present from this country to find that there were so many earnest workers interested in children's dental problems from the various countries of Europe. Even from some of the countries where the financial depression and the results of the war have been more prolonged than in others came evidence of great sacrifice and devotion to ideals.

The progress which has been made in the education of public officials and the people to the value and the necessity for advance along dental lines has, in many instances, been very remarkable. The difficulties which had to be surmounted in the inadequate facilities for demonstration and the lack of funds to carry on experimentation had taxed to the limit the resourcefulness of these enthusiastic and most excellent workers. The reports of progress in children's dentistry which were made to the section on oral hygiene of the Congress from the various countries indicate, in no uncertain way, that the educational work which has been carried on for many years by a few enthusiastic and devoted friends for the betterment of child health conditions is bearing fruit. There has been a surprising awakening of interest in the betterment of child health conditions in many countries and, particularly, the government health departments are showing a commendable and surprising interest in oral hygiene.

THE DENTAL HYGIENIST

As you probably know, there are few, if any, countries abroad which have any provision in their dental practices act permitting a dental hygienist, or any one not dentally qualified, to do prophylactic work. In many places, there has been considerable agitation for the purpose of obtaining legal permission for the dental hygienist to practice. Much difficulty in obtaining amendments to the law has been encountered because of the hostility of the dental profession, quite like that which was experienced in this country in the early days of the agitation for permission for the dental hygienist to practice and as also is the case now in several of the states in this country.

As many of you know, my experience with dental hygienist graduates in public and private service, covering a period of more than sixteen years, convinces me that they are a most necessary adjunct in rendering assistance in prophylactic work. The same fears are expressed

abroad as have been, and are here at home, in some places at the present time, that the dental hygienist will interfere with the work of the regular practitioner and perform operations for which she has not been adequately trained.

These arguments are used abroad to prevent the legalizing of the practice of the dental hygienist. Happily, in many countries, a decided change may be observed, and this is due, in a large measure, to the recognition on the part of medical health officers and dental inspectors that the average dentist, in private practice, is not interested in and does not render good prophylactic service. Among the dental profession in Great Britain, there is a divided opinion with reference to the dental hygienist and, I may also say, with reference to children's dental problems. One of the conditions of the establishment of the Eastman Dental Clinic in London was that provision should be made for the organization of a school for the training of dental hygienists. I am glad to say that, after considerable opposition from various sources, the dental hygienists' school is likely to be started soon. There is a clause in the Dental Practices Act in Great Britain which gives permission to a dental nurse to give treatments and place temporary fillings, a thing that is generally objected to and to which I have always been very strongly opposed. The matter of eliminating this particular section is now before the dental board, and I am hoping that a decision will be made that will require the dental nurse or dental hygienist to do only prophylactic work and inspection under proper direction and supervision.

In every contract made for the establishment of a dental clinic abroad by Mr. Eastman, or by Mr. Rosenwald, there is a provision that the government or municipality will undertake to see that legislation is obtained which will legalize the practice of the dental hygienist.

DENTAL CLINICS IN EUROPE

LONDON

You probably will be interested to hear something of the progress of the various dental clinics established by Mr. Eastman in Europe. The London Clinic was dedicated the latter part of November, 1930. While there are not many interns employed up to this time, good and satisfactory progress is being made. The officials of the London County Council, the board of education, have expressed a willingness to cooperate, and as soon as the necessary machinery can be set in motion, the clinic will no doubt be operating to capacity. The building is one of the most beautiful and substantial structures in Europe, and the facilities for providing children's dental service are not surpassed in any place of which I have knowledge. As you probably know, orthodontia has not received the attention abroad that it has in this country. Recognizing, as we do, the necessity and value of the work in children's dentistry, arrangements are made in each of the clinics for a department of orthodontia, and an endeavor is made to provide a proper endowment for carrying on the work, not only because the value of orthodontia service is recognized, but also that a greater interest may be aroused in this specialty among the members of the dental profession.

ROME

The next Eastman dental clinic to be in operation in Europe will be the one in Rome, and it is expected that the dedication exercises will take place some time early in 1933. I have derived a great deal of pleasure in observing in my vari-

ous interviews with his excellency, Benito Mussolini, the intelligent and enthusiastic interest which he displays in any measures or activities which are brought to his attention for the betterment of the condition and health of the children of Italy. His excellency, on every occasion, has expressed his readiness to make the Eastman clinic in Rome a success.

STOCKHOLM

In Stockholm, the officers of the municipality, headed by Mr. Carlson, are most enthusiastic about the preparation of the plans for the establishment of the clinic in that splendid, progressive and interesting city.

PARIS AND BRUSSELS

The same may be said of the prefect and municipal council of Paris and the famous *Bourgemestre,* Adolph Max, in Brussels. Plans for the clinics in Stockholm, Paris and Brussels are now in the course of preparation and it is expected that building operations will begin within a few days.

BERLIN

The latest clinic for children's dental work to be established in Europe is one which will be provided in Berlin through the generosity of Mr. Julius Rosenwald of Chicago, who has on many occasions demonstrated his great interest in and appreciation of children's dental service. I had the pleasure of offering this clinic on Mr. Rosenwald's behalf to the *Oberburgermeister* of Berlin, Dr. Heinrich Sahm. This offer was very gratefully and appreciatively received and accepted by Dr. Sahm on behalf of the municipality. It is a pleasure to tell you that this Berlin project received the enthusiastic endorsement and support of such well-known leaders for many years past in children's dentistry as Dr. Konrad Cohn and Dr. Mamlock, and many other outstanding and earnest workers in oral hygiene and, particularly, children's dentistry.

While it has not always been easy to demonstrate to government and municipal officers abroad the benefit and value of children's dental service, it is surprising to observe their willingness to cooperate and provide the funds for upkeep and maintenance of the various institutions when once they are shown the great benefits which will come to children in improved health and mouth hygiene from proper dental service.

There has been a surprising awakening abroad in the recognition of the value of good dental service, both for adults and for children. The attention which has been focused on the dental problem by the official and newspaper discussion of the establishment of these various clinics abroad has been of immense value not only in raising the standard of dentistry, but also in calling the attention of the laity to the value of dental service. Dentistry is receiving a recognition from educated and intelligent people abroad which was long past due, and it is a matter of great satisfaction to observe and feel that dentistry now occupies quite as important a position in the general health scheme as that of any other profession.

TREATMENT OF PERIODONTOCLASIA BY SUBGINGIVAL CURETTAGE*

By ARTHUR H. MERRITT, D.D.S., F.A.C.D., F.A.A.P., New York City

PERIODONTOCLASIA is a disease the characteristic of which is pocket formation. This is brought about by the slow breaking down of the alveolar process through the destructive forces of disease. Whether these forces are primarily of local or systemic origin is not now under consideration. Clinically speaking, disease first manifests itself in the gingivae; and, by extension, it brings about solution of continuity in the floor of the gingival crevice, gradual destruction of the pericementum and absorption of the alveolar process. This resorption is not uniform throughout the mouth nor around individual teeth. It occurs most frequently in those regions of the mouth where hygiene is the poorest. The most susceptible points seem to be the proximal spaces in the molar region, though, of course, no area is entirely immune.

When once the phenomenon of alveolar absorption has begun, it will, unless arrested by treatment, continue in the direction of least resistance. This is usually toward the apex and along one or two surfaces of the root only, sometimes extending to the very apex of the root on the involved surface at the same time that the other surfaces show little or no involvement.

While it is true that it may be more or less circumferential around an individual tooth or group of teeth, this is the exception and not the rule. Hence, the terms "horizontal and vertical pyorrhea" have no scientific significance. A pocket of considerable depth may exist on one side of a tooth root with little or no bone destruction on any of the other surfaces. It is this characteristic of periodontoclasia that makes its treatment by subgingival curettage the method of choice. It also has the advantage of restoring the tissues of the mouth to as nearly normal condition as is possible by any form of treatment.

It hardly seems logical therefore to reduce all pockets to the level of the deepest by surgical measures as long as there remains a prospect of affecting a cure by less radical methods.

If now we examine the pocket, it will be found to have two walls: one the root surface and the other the overlying gum tissue. It is the latter that is responsible for the pocket; for if the recession of the gum kept pace with the absorption of the alveolar process, there would be no pocket. On the other hand, if gum recession kept pace with bone resorption, there would be not only a corresponding loss of support, but also great disfigurement from the irregular gum line, and added difficulty in keeping the mouth clean, to say nothing of sensitiveness of the exposed root surfaces. If, again, one carefully examines the walls of the pocket, he will have borne in upon him

*Read before the Section on Periodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

the essential nature of treatment and will understand once for all the futility of all "pyorrhea cures."

Since the pericementum is attached to the cementum on the one side and to the inner wall of the alveolus on the other, it naturally follows that, with the destruction of the alveolar end, the cemental portion remains as a more or less dead and septic covering of the root wall of the pocket. Added to this, there is usually some calculary deposit on the root surface, though, in many instances, this is not a conspicuous feature. The root surface, it may be said, is always more or less covered with a barrier of necrotic pericemental fibers and calculary deposits, interposed between the living cells of the cementum and those of the inner wall of the gum tissue. There is also, in many instances, another barrier, arising from the tendency which the epithelial cells have of dipping down into the pocket and lining, so to speak, the inner wall of the gum tissue, in this way presenting a more or less healed surface. It must be obvious, therefore, that any treatment having for its purpose the conservation rather than the destruction of tissue must have as its primary purpose the removal of these barriers and that any treatment which does not include this is, by the very nature of things, foreordained to failure. Hence, the futility of all therapeutic measures. If, in reply, it is said that these are advocated only as supplemental to instrumentation, answer may be made that where this has been skilfully done, no other treatment is necessary or desirable.

Subgingival curettage has for its purpose the removal of these barriers with a view to placing in physiologic contact the living cells of the cementum with those of the inner wall of the gum tissues, to the end that health may be reestablished in the periodontium. With a complete set of roentgenograms as a guide to the approximate depth of the pockets, instruments are passed into the gingival orifice of the pocket and brought to bear on the root surface as far as it has been denuded of bone for the purpose of removing both the pericemental fibers and calculary deposits. This is done by the use of specially designed instruments which, in different forms, are adapted to reach all surfaces. This is not so much a scaling as a planing operation, the purpose of which is to remove all foreign material of whatever nature from the root surface and leave it smooth and clean. This may be said to be the *sine qua non* in treatment and the point at which most failures occur. It is not always easy, and, in some instances, it is impossible, to pass an instrument into a pocket and completely curet the root surface, but, except in very advanced cases, this can be successfully done and is being done by an increasing number of dentists everywhere.

It is in the advanced case, where pockets are so deep that the root surface cannot be reached and completely curetted, that resort must be had to surgical measures. The point at which this becomes necessary will depend in large measure on the skill and resourcefulness of the operator. The wider his experience, the less often will he find it necessary to apply surgical methods.

After curettement of the root surface is completed, what consideration should be given to the inner wall of the pocket? As a rule, almost none. There are very few, if any, cases in which curettage of the root surface will not at the same time sufficiently break up the epithelial lining of the vascular wall. This is almost inevitable. There are those who maintain that this wall is of a granulomatous nature, implying thereby that it is akin to

the periapical granuloma and that it should be removed by curettement. This is something of a misconception, for it is more in the nature of a granulating surface brought about by the reaction to irritation from the septic and roughened root surface. This is most marked in those cases characterized by heavy deposits of tartar. All that is necessary in these cases is a thorough curettage of the root surface, by which the irritant is removed. When this is skilfully done, the inner wall of the pocket will, as a rule, take care of itself. As in most diseases, if we remove the cause, Nature will do the rest.

It can therefore be said without qualification that there are no obstacles to successful treatment by subgingival curettage except great depth of pocket due to bone loss. Rule this out, as can and should be done among those who seek service early, and you automatically close the door to the necessity for surgical interference.

As we together consider the problem of periodontoclasia and its treatment, it must become increasingly evident that a great responsibility rests on the family dentist. It is to him that the public naturally turns for the solution of all its dental problems. He should therefore be so watchful of their needs as to prevent the development of the case to an advanced stage.

This is entirely possible. Periodontoclasia, always a slowly developing disease, should be diagnosed in its incipiency; and diagnosis is not difficult. No one should accept the dental care of any adult patient without a complete roentgenographic examination. This, with the clinical examination, will reveal periodontoclasia in every stage of its development. When this is done and proper treatment undertaken, there will be no advanced cases and no surgical treatment will ever be necessary. Every case in private practice so far advanced that it cannot be successfully treated by suggingival curettage is a confession of failure.

Surgical periodontia is an indictment of the dental profession made necessary only because of its failure to live up to its responsibilities in the prevention or early treatment of periodontal diseases.

580 Fifth Avenue.

UNUSUAL BONE CAVITIES IN THE MANDIBLE: A REPORT OF THREE CASES OF TRAUMATIC BONE CYSTS*

By THEODOR BLUM, D.D.S., M.D., New York City

UP to a few years ago, I was of the belief that all cysts of the jaws originated from the dental system. If such cysts were not found to be connected with a tooth, it was thought that the tooth had been removed, as so often is the case in radicular and sometimes in follicular cysts. If all teeth were in position and vital and the cyst did not contain a tooth, it was assumed that it might

*Read before the Eighth International Dental Congress, Paris, August, 1931.

have originated from a supernumerary germ which had never developed. Such faulty impressions could only establish themselves in one's mind through neglect to examine carefully every histopathologic specimen removed. With the establishment of a medical laboratory in connection with my offices, such errors will, we earnestly hope, be avoided in the future.

The possibility of cavities forming, particularly in the mandible, similar to the traumatic bone cysts in the long bones was always in my mind, but such cases were not found in the literature nor did they come under my clinical observation until two and a half years ago, when I operated in my first case, about a year later operating in my second and about three months later in a third. Even the interesting and important studies of Bauer[1] and Schneider[2] do not mention these unusual bone cavities in the mandible. Naturally, in the writings of such

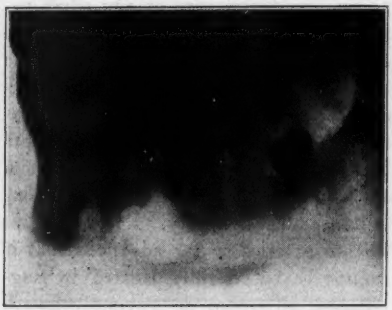


Fig. 1 (Case 1).—Traumatic bone cyst in mandible; before operation.

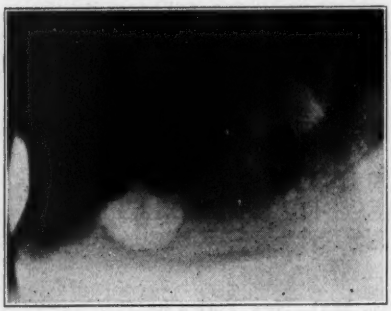


Fig. 2 (Case 1).—One month after operation.

Fig. 3 (Case 1).—One year after operation.

Fig. 4 (Case 1).—Two years after operation.

1. Bauer, Wilhelm: Ueber zystische Bildungen im Kiefer, Ztschr. f. Stomatol., 25: 205-269 (March) 1927.

2. Schneider, Otto: Ueber besondere zystische Bildungen der Kiefer, Ztschr. f. Stomatol., 28:80-96 (Jan.) 1931.

men as von Haberer[3] and Pommer,[4] a study of the jaws is not included.

In 1928, I read a paper before the Section on Oral Surgery, Exodontia and Anesthesia of the A. D. A. entitled "Do All Cysts in the Jaws Originate from the Dental System? (With a Report of Two Nondental Cysts Lined with Ciliated Columnar Epithelium)." It was during the discussion[5] of this paper that Carl D. Lucas, of Los Angeles, Calif., reported what I assume to be the first case of a traumatic bone cyst in the mandible which corresponds entirely to the three cases which I shall discuss in detail. I say "assume" because a histopathologic examination was not made.

For the best understanding of this report, it seems logical not only to give the complete detailed histories of the three cases mentioned above, but also to give them at this time. My associate, H. L.

Fig. 5 (Case 2).—Traumatic bone cyst in mandible (right side before operation).

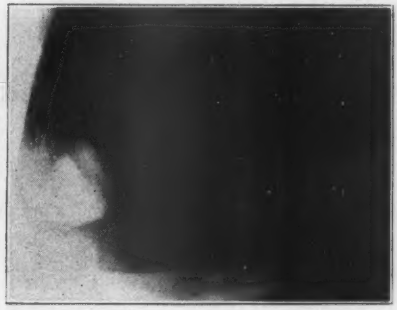


Fig. 7 (Case 2).—Right side seven weeks after operation.

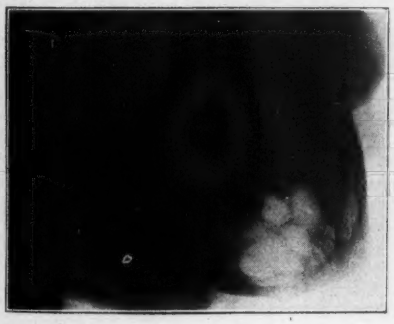


Fig. 6 (Case 2).—Left side before operation.

Fig. 8 (Case 2).—Left side seven weeks after operation.

3. V. Haberer, Hans: Zur Frage der Knochencysten, Arch. f. orthop. u. Unfallchir., 17, 1920.

4. Pommer, Gustav: Zur Kenntnis der progressiven Hämatom und Phlegmasicveränderungen der Röhren Knochen auf Grund der mikroskopischen Befünde im neuen Knochenzystenfalle, in v. Haberer, Hans, Footnote 3.

5. Lucas, Carl D.: Disc. of Blum, Theodor: J.A.D.A., 16:647 (April) 1929.

Reiss, compiled these histories and added comments regarding the pulp-test and transillumination.

REPORT OF CASES

CASE 1.—*History.*—M. B., an American schoolboy, aged 14, appeared for examination, Dec. 22, 1928. The family history was negative. The patient had had measles and whooping cough when an infant. He recalled having received a blow on the right side of the face with a small-sized ax when he was about 6 years of age, which left a scar in the region of the mental foramen on that side. He recalled also having the pulps of the lower right molar extirpated and the canals filled subsequently. Recently, he had visited a dentist, who made a roentgen-ray examination of all the teeth. The dentist accidentally found the condition and referred the patient for an opinion regarding the area of bone absorption in the region of the right mandibular cuspid, first and second bicuspids and first molar. The patient had no pain and no discomfort and was enjoying good health.

Extra-Oral Examination.—There was evidence of a small scar in the cheek about 1 cm. in length, just beneath the lower border of the mandible in the region of the lower right bicuspids. It had no indentation and was not disfiguring. Otherwise, the contour of the features appeared normal.

Intra-Oral Examination.—The teeth and gums were in fair hygienic condition. There were large gold inlays in the lower right second bicuspid and first molar and there was a smaller one in the lower right second molar.

Fig. 9 (Case 2).—Right side one year after operation.

Fig. 10 (Case 2).—Left side one year after operation.

Fig. 11 (Case 3).—Traumatic bone cyst in mandible; before operation.

Fig. 12 (Case 3).—One month after operation.

There was a small amalgam filling in the occlusal fissure of the lower right first bicuspid. By palpation, a slight elevation of the bone was felt at the mucobuccal fold in the region of the lower right bicuspids. The mucous membrane covering this elevation appeared normal. No pain could be elicited on pressure. There was no crepitation. (Fig. 1.)

Operation.—Jan. 4, 1929, a right mandibular injection and a long buccal infiltration of 2 c.c. of procain-epinephrin were made. A semilunar incision was made in the buccal region of the lower first molar to the cuspid, with the convexity upward, the highest point of the incision being a little less than 1 cm. below the free gingiva. The muco-periosteal flap was elevated and held retracted. An opening was made with the gouge and mallet in the outer plate about 1 cm. in diameter to enter the area of bone absorption in this

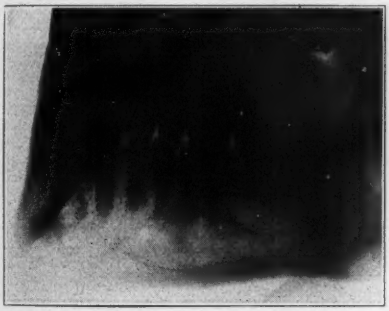


Fig. 13 (Case 3).—One year after operation.

region. The cavity was observed to be of a size corresponding to one seen on the roentgenogram and, at this time, filled with fluid mixed with fresh blood. After swabbing this out with gauze, the cavity was found to be surrounded by smooth bone without any soft tissue lining whatsoever. On the floor of this cavity, there was a slight bulging of bone which represented the roof of the mandibular canal, from the anterior part of which the contents of this canal were seen to emerge, running upward toward the mental foramen, which was exposed on the buccal aspect of the mandible below the apex of the right mandibular first bicuspid. Neither the foramen nor its contents were injured. The bony edges of the cavity were now smoothed and all débris was removed. The flap was replaced and held in position with five dermal sutures.

Subsequent Treatment.—The following day, there was very little swelling and no pain. A 25 per cent solution of argyrol was applied to the region of operation, the treatment being continued every other day for a period of about three weeks. On the fifth day, the

Fig. 14 (Case 2).—Bite films: above, before operation; center, seven weeks after operation; below, one year after operation.

sutures were removed. Follow-up roentgenograms were taken every six months, the last one, Feb. 7, 1931, a little more than two years after the operation. (Figs. 2-4.) (This pro-

cedure will be continued until complete roentgenographic evidence of bone regeneration has taken place.)

Serial Pulp Test and Transillumination.—The preoperative test (Dec. 24, 1928) showed the lower right first molar negative and the lower right second bicuspid responding to a medium high index, probably because of the presence of a large inlay encroaching on the pulp. In view of this fact, it was deemed

Fig. 15.—Radicular cyst of mandible. The definite outline and the missing molar may be noted.

Fig. 16.—Radicular cyst in region of lower left cuspid and bicuspids originating from first biscuspid.

advisable to resort to root-canal therapy and filling prior to the operation. This was done by the patient's dentist. The central and lateral incisors, cuspid and second molar responded normally at the exact index used on the left (unaffected) side.

Nineteen days after operation (Jan. 23), another vitality test revealed little change in the response of the pulps on the side of the operation. It will be well to note that the apex of the lower right first bicuspid appeared roentgenographically to be very close to the bone cavity. Despite this, there was no evidence of pulpal disturbance.

March 21, 1930, about two and one-half months after operation, another pulp test indicated that there were no changes evident. At this time, transillumination revealed buccal and lingual shadows about the devitalized lower second bicuspid and first molar.

June 13, 1931, about one and a half years later, there were no changes in the pulpal response of the teeth of the affected side, with the exception, of course, of the lower right second bicuspid and first molar, which were devitalized and filled prior to the operation.

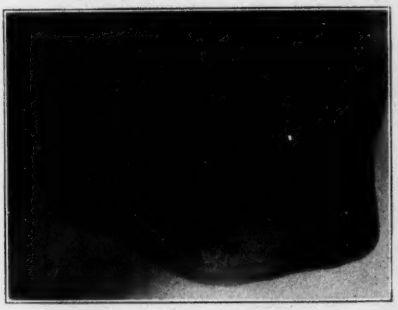


Fig. 17.—Osteitis fibrosa cystica. Irregularly shaped bony masses can be seen within the cystic area.

These two teeth showed buccal and lingual shadows on transillumination at the time also.

CASE 2.—*History.*—H. B., an American boy, a stenographer, aged 17, appeared for examination, Jan. 27, 1930. The family history was negative. The parents had eight children, all living and in good health. The patient had had influenza at the age of 6. He had been struck by an automobile about nine years before. He recalled that he was hurt and sent to the hospital, but did not require treatment. During a recent examination of his teeth, his dentist took roentgenograms prior to treatment and discovered evidence of bone absorption in the region from the right lower cuspid to the left lower second bicuspid inclusive. He was referred for an opinion.

He had no pain, was in good health and was not cognizant of any dental disorders.

Extra-Oral Examination.—This was negative.

Intra-Oral Examination.—The mouth appeared to be in good hygienic condition. The following teeth were missing: the right upper first molar, the right lower second bicuspid and the left lower first molar. In the floor of the mouth on the left side, a slight elevation extended from the lower left central incisor to the lower left second bicuspid inclusive. Deeper down in the lower border of the mandible in this region, a semihard mass was felt, extending from the lower left central incisor to the lower left second bicuspid and slightly tender to pressure. Salivary secretions were moderate. (Figs. 5-6.)

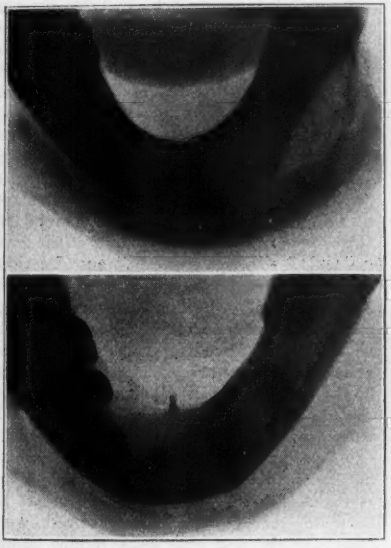


Fig. 18.—Giant-cell tumors of mandible (somewhat similar to that in Case 2). Bite films show (above) distension of labial plate: irregular fine bony lamellae running through radiolucent area; and, below, distension of lingual plate.

Operation.—March 7, a left mandibular injection was made, followed by local infiltration buccally and lingually to the right of the median line. A semilunar incision was made from the lower right to the lower left first bicuspids on the labial side, with the convexity upward, the highest point of the convexity being approximately 1 cm. below the free gingiva in the region of the lower left lateral incisor. The mucoperiosteal flap so outlined was elevated and held retracted. The buccal layer of bone seemed to be thinned out in the region of the lower left lateral incisor and cuspid, giving the impression of being transparent and dark bluish. The portion of the outer plate in the apical region of the lower left lateral incisor about 1 cm. in diameter was removed with chisel and mallet. This procedure exposed the cavity, which was filled with clear colorless fluid. About 5 c.c. of fluid was removed by aspiration, but at this time it had become somewhat blood tinged. The bone cavity which was not exposed was free of any lining and showed the formation of sinuses, this formation apparently depending on the resistance of dense bone in different parts of the

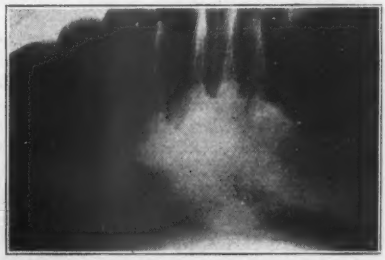


Fig. 19.—Solid adamantinoma of mandible, with irregular bony circumference and bony projections toward center.

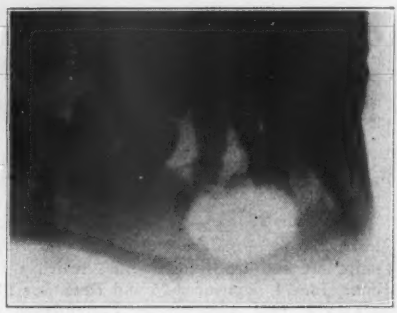


Fig. 20.—Cystic adamantinoma of mandible.

mandible. A few nerves were found exposed, but apparently none of the apices of the teeth in this region. It was now decided to remove as much as possible of the outer plate from the lower left lateral to the lower left first bicuspid. Only the lips of the wound at the extreme right and left sides of the incision were approximated with one suture each, while at the inner portion of the flap, the cut surface was sutured to the lowest part of the periosteum in this region. Argyrol and iodoform gauze packing was used.

Subsequent Treatment.—The patient returned the following day with some pain and a little swelling. He was seen subsequently every other day and the dressing changed until March 19, when the gauze was discontinued. He was discharged, April 18, and

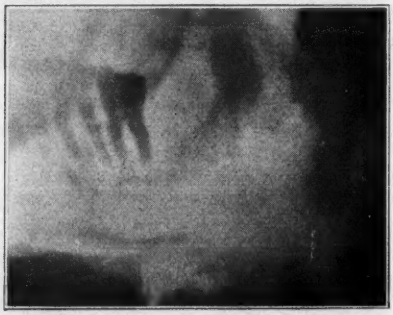


Fig. 21.—Carcinoma of mandible. The irregular diffuse outline has no distinct borderline.

instructed to return in June for a follow-up pulp test and transillumination, which was done, June 4, September 26 and December 19. March 4, 1931, roentgen-ray examination, a pulp test and transillumination was made, a procedure which will be followed out routinely every six months until there is conclusive evidence of complete bone regeneration. (Figs. 7-10.)

Serial Pulp Test and Transillumination.—Feb. 7, 1930, a preoperative test showed all mandibular teeth responding normally. March 21, two weeks after the operation, the left mandibular central and lateral incisors did not respond to a vitality test. This may have been due to the postoperative paresthesia which existed at that time. April 7, one month later, these incisors responded to high indices, showing evidences of change. June 4, almost three months later, the left central incisor responded normally, while the lateral responded only to an abnormally high index. December 19, ten months later, both incisors responded normally, and they continued to do so in subsequent tests, the last of which was made on March 4, 1931, approximately one year later.

The importance of doing serial pulp tests is here illustrated as well as in other cases. If one were to accept the results obtained from a single test, it is obvious that an error would result.

Transillumination.—Feb. 7, 1930, prior to operation, transillumination revealed a shadow apparently through the body of the mandible from the right lower cuspid to the left lower second bicuspid about 2.5 cm. in diameter and below the apices of the teeth. Two weeks after operation, there was no shadow evident on transillumination, the only thing that was discerned being the opening in the bone in the left lower central and lateral incisor and cuspid region. Subsequent examination by this means never disclosed recurrence of shadows.

CASE 3.—*History.*—E. S., an American schoolboy, aged 17, appeared for examination, March 19, 1930. The family history was negative. The patient had had measles in childhood and influenza, several times, the last attack the past winter. He stated that he was hit by an automobile about two years ago, and he recalled being injured on the left side of his head. He also recalled that, about one year before, he was hit by a baseball, but he was not quite certain which side of the jaw was struck. About one week before he came in, roentgenograms of his teeth were taken for the first time in a routine dental examination by the dentist and a large area of bone absorption in the right mandible was disclosed. The patient was referred for diagnosis. He had no pain.

Extra-Oral Examination.—This was negative.

Intra-Oral Examination.—The teeth and gums were in good condition. The full complement of teeth were present with the exception of the third molars. There were a few well made fillings in the posterior teeth, and there was marked malocclusion. There was no evidence to the palpating finger of any bony irregularities. The salivary secretions were moderate. (Fig. 11.)

Operation.—April 4, 1930, a right mandibular injection and a long buccal infiltration of 2 c.c. of procain-epinephrin were given. An attempt was made to aspirate the bone cavity in the apical region between the lower right first molar and the second bicuspid, but it was impossible to penetrate the bony wall with the needle. A horizontal incision extending from the lower right second molar to the first bicuspid with a downward curvature in the region of the lower right first bicuspid was made on the buccal side about 1 cm. below the free gingiva. This mucoperiosteal flap was elevated and held retracted and an opening was made in the buccal plate of bone in the apical region between the lower right second bicuspid and first molar. The bony plate in this region was found to be about 0.25 cm. in thickness. Through the opening, the bony cavity was aspirated and altogether about 6 c.c. of fluid was removed, which, on account of the bleeding, appeared somewhat sanguineous. On examination, the bony cavity appeared to be uncovered; that is to say, there was no cyst membrane present. The flap was now replaced and held in position with four dermal sutures. The specimen of fluid was sent to Dr. Sondern for culture (reported negative) and the tissue specimen retained for histologic examination in our laboratory.

Subsequent Treatment.—As in the other cases, the boy was seen on the day after the operation and thereafter every other day until April 30 and treated similarly. As no gauze was used, the treatment consisted of applying a 25 per cent argyrol solution to the field of operation. The sutures were removed on the fifth day. Retesting of the mandibular teeth was done, April 18 and 25, roentgenograms being again taken. The patient was discharged, April 30, and instructed to return in one month, at which time transillumination and a pulp test were carried out. Subsequent roentgenograms and vitality tests were made about every three months, the last of which was recorded, April 13, 1931. (Figs. 12-13.)

Fig. 22 (Case 2).—Intra-oral films taken before and one year after operation.

Serial Pulp Test and Transillumination.—In this case, there was no change at any time in the reaction of the pulps of the teeth on the affected side either preoperatively or postoperatively. The lower right first molar subsequently showed slight pulpal changes after a large inlay had been inserted; which would account for these slight degenerative changes. Transillumination at all times was negative. The fluoroscopic and roentgenographic examination of the long bones of all

three patients failed to reveal the presence of cysts or other abnormal changes.

From the foregoing, it must be clear to all that the two most important factors, aside from the final conclusion based upon the histopathologic examination, in arriving at a correct diagnosis are, first of all, the history of trauma and, secondly, the roentgen-ray examination. It is true that all these bone cavities, whether large or small, are well circumscribed, but there is missing the distinct bordering bony line which is so typical of radicular and follicular cysts. Wherever the teeth apparently are involved in this bone cavity, the exposed root is always covered by a distinct peridental lamella. This seems to be typical of this condition. (Figs. 1, 5, 6 and 11.) The roentgen rays also reveal, in one case (2), a marked distension of the lingual as well as the labial plate. (Fig. 14.) In this case, the bone cavity also extends very close to the lower border of the mandible. The subsequent postoperative changes in the bone will be discussed later.

As mentioned before, the roentgenograms of these unusual bone cavities do not reveal this marked bony line surrounding a radicular or a follicular cyst. (Figs. 15-16.) In addition, the presence of the causative agent, namely, a tooth or a missing member of the masticatory apparatus, will prevent one from making

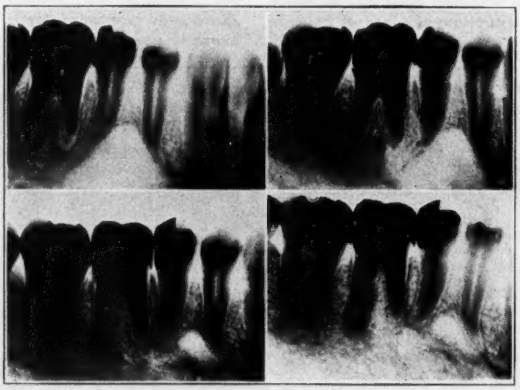


Fig. 23 (Case 1).—Intra-oral films taken before operation, one month, one year and two years after operation.

Fig. 24 (Case 3).—Intra-oral films taken before (left) and one year after (right) operation.

an incorrect diagnosis. Attention must be called to the fact that in the roentgenograms, taken nine years after operation in this one instance, a follicular cyst in the mandible looked very much like a so-called bone cyst.

Osteitis fibrosa could be mistaken for a bone cavity were it not for the irregularly shaped bony masses which are visible and located within such an area. (Fig. 17.) The irregular fine bony lines running through a giant-cell tumor as seen in the roentgenogram will distinguish it from the condition under discussion. (Fig. 18.) The solid adamatinoma also shows an irregular bony circumference from which arise bony projections extending toward its center and differentiating it from so-called bone cysts. (Fig. 19.) The cystic adamantinoma is more irregular in outline and shows smaller cysts clearly in one part or another. (Fig. 20.) Carcinoma, in the mandible, is characterized by an irregular diffuse outline with no distinct borderline. (Fig. 21.) While speaking of the differential diagnosis, one must not forget to include the normal appearance of the cancellous portion of the mandible, which, on account of the lack of bony trabeculae and, therefore, of large bone spaces may at times simulate a traumatic bone cyst. A roentgen-ray examination of the opposite side, as well as a history which is negative in regard to trauma, will solve the diagnosis.

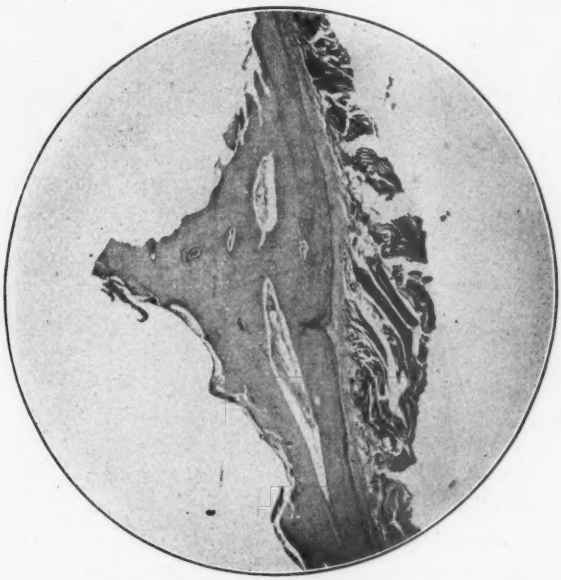


Fig. 25.—Buccal plate showing sinus formation.

A study of the history of the three cases reveals the fact that we are dealing with rather young healthy patients, each receiving a trauma which, on account of the absence of any other possible cause, must be considered the etiologic factor. It

is remarkable that the largest bone cavity was found in Case 2, in which the interval between trauma and the detection of the lesion was the shortest; namely, only two years. The thought naturally enters one's mind as to whether the two other cases showed a less extensive process on account of the location or whether the process had not only come to a standstill, but had also begun to heal. Case 3 did receive a second injury one year after the first, through which, in accordance with the theory of Pommer,[4] an investigator of these lesions in long bones, the healing process may have started.

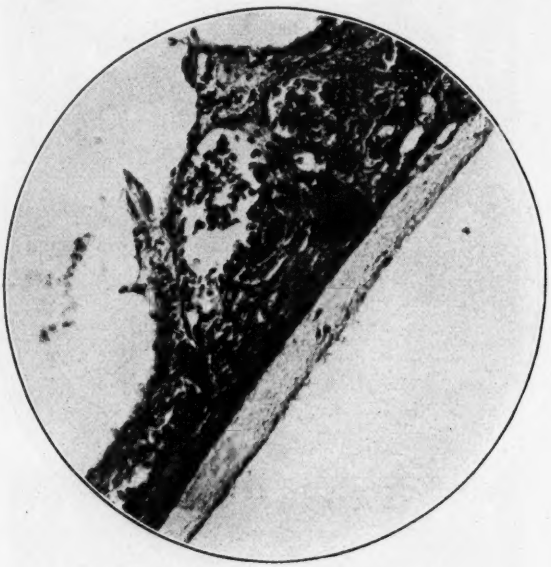


Fig. 26.—Lining membrane (high power).

Before discussing the question of operative procedure, the reader may be interested to know why these operations were performed at all. I am frank to admit two things: (1) I was quite certain that we were not dealing with any of the usual conditions; and (2) the only positive diagnosis of a traumatic bone cyst could be made by operating and, perhaps, by microscopic examination of the specimen. The operation itself was the same for all three cases except for the last step, which was different in Case 2. In each, after an appropriate incision, the outer plate of bone was removed, the fluid aspirated and the bone cavity inspected. This cavity was always found without a soft tissue lining as far as could be determined by the naked eye. Cases 1 and 3 were entirely closed and the sutures removed in due time. In Case 2, the wound was left open, the bone cavity allowed to fill with a blood clot and a small piece of iodoform gauze placed over the bony opening in the outer plate. Part of this blood clot later broke down, but the whole cavity was very quickly filled with granulating tissue and, as we can see now from the latest roent-

genograms, is completely filled with bone (Figs. 22, 9 and 10), although it was operated on two years later than Case 1 and just about two months earlier than Case 3. Both Cases 1 and 3 still show some evidence of lack of complete filling out of these cavities with bone. (Figs. 23, 24, 4 and 13.)

It may be suggested that these patients would get well by aspiration alone. While this is quite possible, it would not give the operator an opportunity to make a positive diagnosis, for which inspection and a histopathologic examination are necessary. Apparently, these cases are so rare that one cannot entirely depend on the history of trauma, a roentgen-ray examination and the condition of the aspirated fluid. The extreme rarity of this condition can be estimated by the statement that eighty-three dry mandibles examined by means of the roentgen rays, as well as about 5,000 case histories, did not show any such roentgen-ray findings. It has been said that a biopsy[6] is not conclusive, because a tumor or what not may be another part of the lesion. The only specimen that we take for microscopic examination is procured at the time of operation, when the inspection of the bone cavity would reveal the presence of another pathologic lesion. Even though these conditions are very rare, it is of extreme importance to keep them in mind because at least in one case (3), a diagnosis of a malignant condition was made and the patient was advised to have all the involved teeth, five in number, removed. It is always best to examine the opposite side by the roentgen rays for comparison.

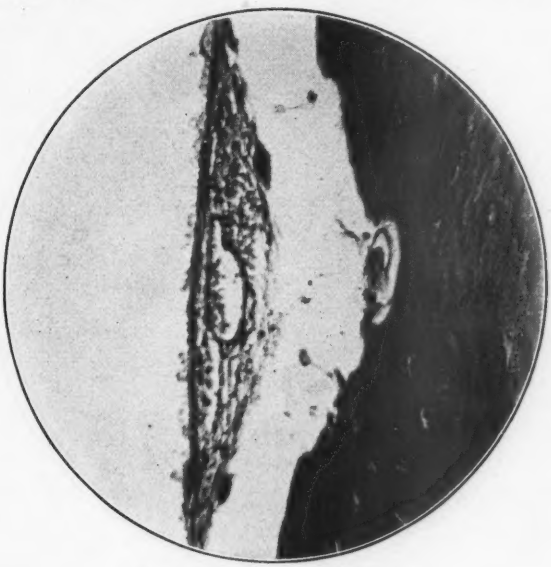


Fig. 27.—Osteoclastic absorption.

6. Gaugele, K.: Zur Frage der Knochencysten und der Ost. fibr. von Recklinghausen's, Arch. f. Klin. Chir., 83, 1907.

The absence of any inflammation was quite apparent. It is also evident that this process does not encroach upon nor involve vital structures, and therefore the roots of the teeth were never found uncovered, but always protected by the peridental lamella. The inferior dental bony canal may have been prominent, but its contents were only exposed when nearing the mental foramen. Only in Case 2 were the nerve filaments entirely exposed, and one part was removed for examination. Of course, we understand that the bone surrounding the teeth and forming the inferior dental canal is quite dense, but so is the outer and inner plate of the mandible, as well as the lower border, which was nearly entirely lost at one point in Case 2; while the outer plate of bone was entirely absorbed in the same case at another point.

The findings at operation confirmed the supposition, based on the roentgen-ray pictures, that we are not dealing with any kind of dental cyst, but with a different type, namely, a so-called bone cyst, the particular variety of which had to be determined by the histopathologic examination. Bone cyst is a term generally accepted for certain cystic enlargements of the long bones, in which no epithelial lining is present. They are usually the result of degeneration and softening of real central neoplasms or of an inter-

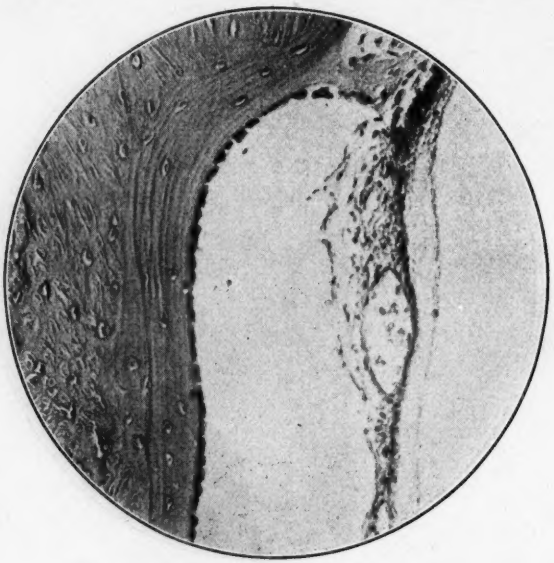


Fig. 28.—New bone formation by osteoblasts.

medullary hemorrhage occurring in them or, more frequently, secondarily in an osteitis fibrosa. Some authors suppose that an inflammatory hemorrhage exists. Bötticher[7] and Benecke[8] were the first to

7. Boetticher: Ueber Knochenzysten im Humerus, Zentralbl. f. Chir., 1904, No. 27, p. 157 (Suppl.).

8. Beneke, R.: Verhandl. d. deutsch. pathol. Gesellsch., 1904, Part 1, p. 240.

conceive of a traumatic hematomcyst developing in a previously healthy bone. This theory was followed by a long discussion until Hans v. Haberer[9] clinically, and chiefly Pommer[4] through histopathologic examinations, confirmed the existence and mechanism of the traumatic bone cyst. Certainly such a diagnosis is only possible after the most thorough examination and after the elimination of other more usual causes. Although in our cases, macroscopically, no soft tissue lining could be found at all, the removed bony pieces were prepared and examined. (The pathologic report and discussion was written by A. Furedi, who is in charge of my medical laboratory.)

Unfortunately, the specimen of the first case could not be examined. Macroscopically, some of the fragments were showing a periosteal covering, and the inner surfaces seemed to be bare. The larger pieces showed small sinus formations. Such a sinus formation is illustrated in Figure 25, which was taken from a fragment of the removed buccal plate. The bony plate is thinned out and two markedly enlarged narrow spaces can be observed within the lamellar structure. The outer surface is covered by periosteum and some muscle tissue.

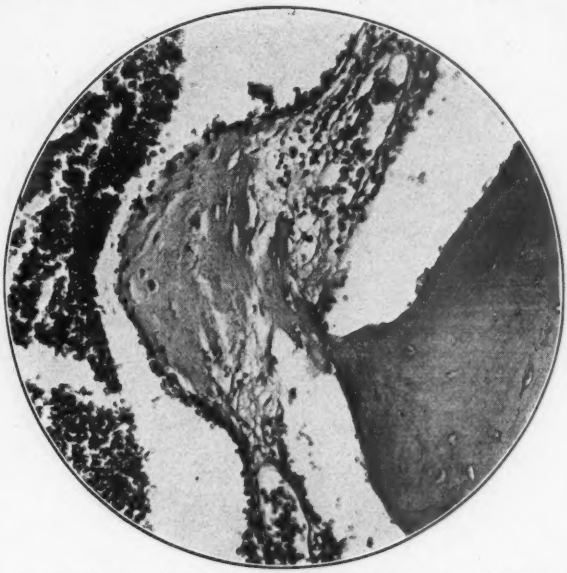


Fig. 29.—New bone formation, "Strähniger knochenbelag."

Even under low power, one notices that the surface toward the lumen is covered by a thin layer which reaches from one prominence of the bone to the other in archlike formation. High magnification (Fig. 26) of this layer reveals that its chief constituents are blood vessels engorged with red blood corpuscles and serum. The vessels are embedded in a very loose meshwork of connective tis-

9. V. Haberer, Hans: Footnote 3; Zur Frage der Knochencysten, Arch. f. klin. Chir., 82, 1907; id., ibid., 1910.

sue fibers and cells in which, near the markedly distended vessels, red blood corpuscles are seen. The thickness of this lining membrane varies in different parts, in some areas only a very thin somewhat homogeneous endosteum-like membrane being visible. The fibers toward the lumen are more densely packed together, and attached to them as the innermost layer, a compressed mass of dissolved red blood corpuscles is distinguishable. In all of the different sections, the innermost layer was always a mass of more or less changed blood; in some areas, organized, in others a homogeneous hyaline mass with some cell débris or masses of blood pigment.

These findings prove that the duration of the process must have been long; but, in addition to this changed blood, quite fresh blood was also present; namely, as mentioned before, as an extravasation in the lining membrane, and also in the marrow spaces near the vessels and within the cyst lumen. Figure 27 also shows this lining membrane, but with the underlying bone—the separation is an artefact. The bony edge is irregular, areas of lacunar absorption are present and therefore the corresponding covering membrane shows osteoclasts. This picture reveals that, under certain circumstances, the membrane produces osteoclasts (which are always to be found only where there are capillaries, proving their origin) for bony destruction. Just the opposite function of the membrane can be noticed in Figure 28, where the bony surface is covered by a regularly arranged layer of osteoblasts and a layer of newly deposited bone.

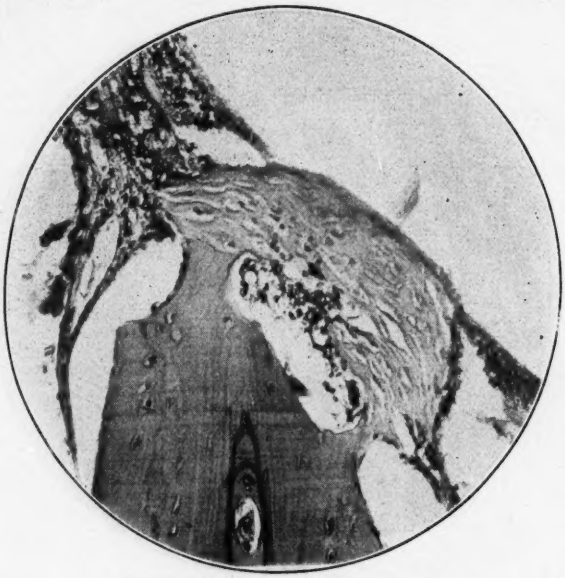


Fig. 30.—Osteoclasts absorbing new bone.

Besides this osteoblastic bone rebuilding, which we must look on as a tendency of natural repair, another type of new

bone formation is present; i.e., the lining membrane itself changes into bone. (Fig. 29.) The location and structure of this new bone is peculiar; it is best characterized by Pommer[4] as *straehniger knochenbelag*. It is formed where pressure and pulling affect the membrane simultaneously. As these outside influences are not constant, neither is this bone a permanent product. Figure 30 shows the beginning osteoclastic destruction of the old and of this new bone. This formation and destruction of bone in the same or neighboring areas is also noticeable in the few marrow spaces of our specimens. Some of them are very markedly enlarged by a very active osteoclastic bone resorption, as seen in Figure 31. Other spaces show new bone apposition by osteoblasts or both processes, as in Figure 32, where, in addition to the regular layer of osteoblasts, some osteoclasts are also present. Very important is the fact that the marrow itself, as these pictures prove, is in fairly normal condition. It does not show the marked fibrous character as in osteitis fibrosa. The fact that, in some areas, it is slightly changed, i.e., somewhat more cellular, fibrous or edematous, finds its explanation in the local pathologic condition, which we will discuss later. The bone shows in some areas certain atrophic changes, but nothing atypical, nor does it show softening. The periosteal surface is either in an indifferent stage or shows osteoclastic resorption (Fig. 33). The canals contain vessels dilated by red blood corpuscles, serum or a hyaline mass, which is also a distinct sign of stagnation. (Fig. 34.)

Fig. 31.—Osteoclasts within marrow space.

If we correlate the histologic data gained by the examination, we come to the conclusion that there is no neoplastic process or osteitis fibrosa present, but that

the changes are quite similar to what Pommer found in the case of von Haberer's[8] traumatic hematomcyst in a long bone (humerus). The process is an intermedullary hemorrhage due to some trauma. Haberer[8] mentions that in addition to the traumatic influence, some individual peculiarity such as of the blood vessel wall or of the coagulation of the blood, has to play a part because there is a marked inconsistency in the frequency of traumatic injuries of the bones and the rarity of such cyst formation.

On the other hand, trauma usually results in fracture. For the formation of the traumatic cyst, it is absolutely necessary that the trauma leave the bone shaft intact: there must not be any communication between the hemorrhagic area and the surrounding soft tissues. This fact accounts for the negative results of Lexer's[10] animal experiments. He destroyed the substantia spongiosa, causing a marked intraosseous hemorrhage, but it healed without any cystic formation. In the case of closed intraosseous hemorrhage, the increase of local pressure interferes with the lymphatic circulation and that of the veins within the marrow. Consequently, the serous transudation increases in the region of the cyst on account of lack of resorption.

Fig. 32.—Osteoblasts and osteoclasts in marrow space.

Thus, in combination with the pressure of the hemorrhage itself, that of the transudate is responsible for the regional circulatory disturbance. The first sign of this is local edema: all the vessels become enlarged and engorged, the marrow edematous. Pommer[4] calls it *Schleim-*

10. Lexer, E.: Ueber die nichtparasitischen Zysten der langen Roehrenknochen, Arch. f. klin. Chir., 81:379, Part 2, 1906.

mark. On the other hand, the hemorrhage itself acts as a foreign body and with the irritation of the increased pressure arises a condition called *phlegmasie* by Pommer.[4] This is a local edema with reactive inflammatory irritation of the tissues. This accounts for the more cellular and fibrous character of the marrow in some areas and for the encapsulation of the hemorrhage itself. The enlargement of the cystic area is kept up by the continuous pressure of the transudate and thinned out, new areas join the original lumen. At the time of fusion, the pressure temporarily decreases, and Nature immediately begins its repair, osteoblasts are produced and new bony layers deposited. Thus, destruction and reformation follow each other, but as the former is more extensive than the latter, the result will be that of a slow but distinct cystic enlargement. A characteristic sign of the pressure—more so of pressure made by fluid—are the sinus formations

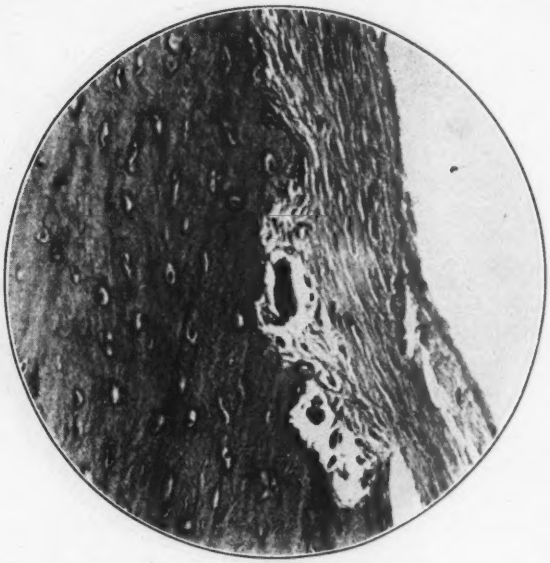


Fig. 33.—Lacunar absorption at periosteum.

also by diapedesis and by rhexis (free red corpuscles in the tissues and slightly changed blood in the lumen).

On the other hand, the pressure irritates the marrow, resulting in the production of osteoclasts and the destruction of the bone, not only around the edge of the lumen, but also in the neighboring marrow spaces. Certainly, whenever the separating walls become sufficiently and the archlike arrangement of the limiting membrane. In some areas, the cysts appear quite round through the newly formed *strähnenknochen*. (Fig. 35.) Pommer's explanation and findings correspond absolutely with ours, and we are therefore dealing no doubt with a traumatic hematoma of the type found in the long bones.

The postoperative care of these cases

consisted mainly of periodic roentgen-ray examination, pulp test and transillumination. The patients have continued to be in good health and had no discomfort except for the necessity of dental operation. No teeth were lost and the vitality of the teeth returned in Case 2, having apparently been lost. Transillumination is normal. The periodic roentgen-ray examinations revealed gradual filling of these cavities with bone. Only in Case 2 do we find the formerly affected area completely filled in. The bulging of the labial and buccal plates in Case 2 have also nearly disappeared and the contour is now practically normal. (Fig. 14.)

In summing up their present condition, I can say that they could unquestionably be discharged were it not for the fact that, for obvious reasons, I am very much interested to continue to examine them by the roentgen-rays at yearly intervals.

CONCLUSION

We are unquestionably dealing with three cases of traumatic bone cysts (hematomcysts) of the mandible in accordance with the studies of von Haberer and Pommer.

To my knowledge, such cases have never been studied nor reported, with the exception of the case history, without pathologic study, of Dr. Lucas.

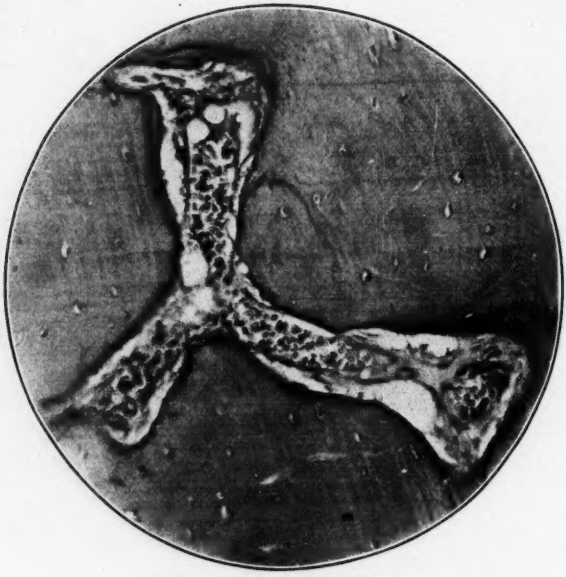


Fig. 34.—Engorged vessels in canal.

All three cases have a definite history of trauma, one case presenting even two such occurrences.

The fluoroscopic and roentgenographic examination of all the long bones was negative in all three cases.

The diagnosis from a roentgenogram alone would be quite difficult, but it is

simplified through the study of the complete history including pulp test and transillumination. If all teeth are present and vital, the ordinary dental cysts can be excluded. The absence of one or more teeth must make one more cautious.

The only absolutely conclusive findings depend on the histopathologic examination.

Judging by the operative results obtained and the evidence of the follow-up records, one must conclude that the open operation, as in Case 2, must be recommended as the method of choice.

Attention must be called to the possibility of a continuation of the process in Case 1, an impression which is easily gained by a careful study of the roentgenograms.

I must therefore mention again our preference of the open operation because of its superiority over aspiration only, as well as over the closed method.

If general dental practitioners and oral surgeons could be convinced of the advisability and necessity of taking large extra-oral films in all their cases, as I feel should be done, a number, even though small, of traumatic bone cysts in the mandible might be found. At any rate, all practitioners should bear this condition in mind and report their occurrences in the interest of further study.

Fig. 35.—Small cyst formation.

Finally, I feel justified in saying that traumatic bone cysts of the mandible occur only in young persons because the same amount of trauma in older patients probably would cause a fracture, by which all the conditions necessary for the formation of traumatic bone cysts would be eliminated.

101 East Seventy-Ninth Street.

RESEARCH IN PERIODONTOLOGY: A PLEA FOR LABORATORY EXPERIMENTATION*

By HAROLD J. LEONARD, D.D.S., B.A., New York City

THE art of periodontia is not making satisfactory progress. More and more dentists are using the art and more and more patients are demanding it; but the art itself has developed but little in the last ten years. Skilful periodontists are doing the same type of root surface curettage, patients are getting much the same type of instruction in home care and the same efforts are being made to relieve undue stresses and restore function and balance to the occlusion. These local treatments in competent hands give excellent results, and if patients will submit to frequent inspection and follow-up treatments, periodontoclasia may be held permanently in check. This is so great an accomplishment that practitioners have been satisfied with it, hardly realizing that they have been controlling symptoms only, not curing the disease. The fundamental causes of periodontoclasia are still largely unknown, and hence can only occasionally be attacked in a way to eliminate the tendency to its occurrence.

It is my purpose in this paper to indicate some of the problems in periodontology most needing solution and to suggest the method by which research to solve them may be developed. Until these problems are solved, the art of periodontia must remain largely empiric. When they are solved, a great advance can be made in eliminating the tendency to this disease and the art will be placed on a sound rational basis.

What, then, are our present concepts of the etiology and pathology of this disease?

Periodontoclasia is an inflammatory disease of the periodontal tissues beginning at the base of the gingival sulcus. It is believed that the inflammation is caused by micro-organisms which, because of their quantity or because of lowered vitality of the tissues, penetrate the epithelial lining of the sulcus and grow in the subepithelial connective tissue. The micro-organisms chiefly concerned are *Streptococcus viridans, staphylococcus albus,* Vincent's organisms and possibly fungi. As the inflammation spreads into the pericementum, the epithelial lining of the gingival sulcus extends along the cementum. Pocket formation, that is, pathologic deepening of the sulcus, occurs either as a progressive ulcerative necrosis of the pericemental tissue or as a splitting of the epithelium which has been projected along the cementum. As the inflammatory zone widens, it involves the alveolar process, which, in turn, becomes rarefied and finally absorbed. The loss of supporting bone and the softening of the connective tissue fibers of the gingiva and pericementum which are involved in the inflammatory zone allow the tooth to loosen and become extruded or shift its position, and

*Read before the Section on Periodontia at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 21, 1931.

the gingiva to hang loosely away from the tooth.

The process is complicated by various local conditions. Food impaction or overhanging metal margins may originate or aggravate the gingival inflammation. From the inflammatory exudate in the gingival sulcus, calculus usually forms on the subgingival enamel and cementum. Because of its roughness and high microbic content, it adds greatly to the irritation. A vicious circle is thus established which, unless broken by removal of the calculus, will lead inevitably to loss of the tooth.

Uneven wear of the teeth or shifting from loss of contacts or other causes may cause certain cusps to interfere with masticatory movements. Such interference leads to torsional stresses on the tooth which are in excess of what the alveolar bone will stand. The alveolar bone becomes absorbed on the injured side and the tooth is loosened. Such loosening allows extrusion; and, once extruded, the tooth no longer glides by its antagonist but rocks with it. A mechanical irritation due to such movement may apparently initiate periodontoclasia. Usually, the reverse is true: the tooth is loosened by periodontoclasia and extrusion brings on the rocking movement. Thus, another vicious circle is created.

Systemic conditions also play an important part in aggravating and perhaps initiating the disease. Various vascular disturbances leading to local infection and inflammation of the gingiva are well known. Poisoning by mercury or potassium iodid will lead to forms of gingivitis. Scurvy, purpura hemorrhagica and leukemia give gingival manifestations so distinctive as to be almost pathognomonic. Frequently, these gingival symptoms are the first signs of the disease. Pregnancy is frequently accompanied by large tumor-like areas arising from hypertrophy of the gingival papillae and which disappear after delivery. Various dietary defects in animals and man commonly lead to simple gingivitis or periodontoclasia. Systemic illness of any kind aggravates any existing tendency to soreness and looseness of the teeth and hastens the destructive inflammatory process.

Sordes and salivary calculus accumulations on the teeth are highly irritating to the gingiva and may eventually cause recession and tooth loss. This may occur even in persons whose resistance to bacterial invasion is such that pockets do not form. Eskimos of the far North, whose resistance to caries and periodontoclasia is phenomenal, commonly have heavy accumulations of salivary calculus and sordes with horizontal gingival recession and, in the end, loss of teeth.

This résumé of the etiology and pathology of gingivitis and periodontoclasia affords a starting point from which to ask some fundamental questions.

Let us first analyze the factor of excessive bacterial growth on the teeth. What causes it? Animals in the wild state have comparatively clean teeth and practically no gingivitis or periodontoclasia. Many savage human tribes are similarly favored. On the other hand, modern Americans and Europeans, even with all the care induced by professional education and commercial dentifrice advertising, usually have so much microbic growth on the teeth that inflammatory conditions are present in the gingiva.

Gottlieb, who has made thousands of sections of gingival tissue, says that he has found but one case in which no signs of inflammation and microbic invasion were present at the base of the gingival sulcus.

Black has shown that, in many persons, overeating causes a heavy coating

of protein material from the saliva to be deposited on the teeth from two to four hours after the meal.

In Reid Blair's book, "In the Zoo," the difficulties arising from concretions on the teeth and gingivitis in lions and other carnivora in captivity are described. These defects can be prevented only by frequent short periods of starvation.

Is it not probable that the excessive bacterial growth on the teeth of modern man is associated with this protein deposit from overeating? Certainly many individuals who for one reason and another have limited their diets to the minimum of caloric requirement are singularly free from both salivary calculus and gingivitis.

It appears that overeating, acting through salivary protein, in promoting abundant microbic growth on the teeth, is a fundamental cause. Research should establish the facts upon which we may base a rule of practice for our patients. Evidently, a physiologically clean mouth is possible. It is of prime importance that we discover the conditions making for a physiologically clean mouth and apply the principles involved to the treatment of our patients.

Having considered microbic growth from the standpoint of sheer bulk, we should also consider it from the standpoint of virulence. The mouth tissues are open to invasion by all the micro-organisms that are commonly found in the environment. Most of these are harmless and, even though growing on the teeth, are merely saprophytic. Others are not. Individual human beings vary in the chemistry and vitality of their tissues. Micro-organisms which are usually saprophytic may, in some persons, manifest pathogenic properties. What do we now know of these relations between host and parasite at the marginal gingiva? Why are Vincent's organisms, which are common saprophytes, occasionally virulently parasitic? Why are fungi, which, according to Cahn are always present on the teeth, occasionally found as parasites on the gingiva? What makes certain persons susceptible? What hygienic or immunologic treatments should be given our patients to prevent invasion? We should be as much concerned with this as the dermatologist or the gastro-enterologist. A vast field of research is herein opened and urgently needs attention. All of these problems are capable of solution by experimental research and should be solved through the efforts of our profession.

More work has been done on the histopathology of the periodontal tissues than on any other scientific phase of our subject. Especially are we indebted to our European confrères for work along this line; yet even this subject is but in its infancy. Disputes still rage as to whether the downward growth of the epithelium along the cementum is a cause or an effect of pocket formation. Very little correlation has been attempted between this epithelial proliferation and epithelial hyperplasia elsewhere as in vitamin A deficiency disease. The questions raised should be readily soluble by animal experimentation. While we smugly assume that, because we can cure the symptoms by scaling and massage, we are masters of our calling, what do we really know about what we are doing? If we apparently get reattachment, have we an actual reattachment of connective tissue to denuded cementum? If so, what has become of the epithelium which formerly projected beyond the point of denudation? These things are all capable of experimental demonstration.

These questions may seem impractical. I assure you that they are not. Surgery

is based on knowledge of pathology and we are surely engaged in a complicated even if minor surgical procedure. If the epithelial lining of the pocket interferes with reattachment, it sould be curetted away as advocated by Box, or dissolved away as advocated by McCall, if such a thing is possible. If the epithelium does not interfere with reattachment, these efforts to remove it are unjustifiable additions to the sufferings of the patient. If reattachment cannot be effected at all, logically we should resect the gingiva to a point where a normal sulcus depth will remain as advocated by the oral surgeons. If reattachment is possible and practicable, surgical resection is barbarous. Wherein lies the truth? It cannot be gained by argument based upon individual technics. It must be obtained by painstaking study of the results of animal and human laboratory experimentation. Almost no such work is going forward. We who are engaged in this field and see the need must furnish the stimulus for such studies.

Another field which is unexplored is the physiology of alveolar bone. We are as intimately concerned with bone as is the orthopedic surgeon. The tooth is supported by bone which is built in around it as it erupts, in accordance with function, heredity and general bone metabolism. Under normal conditions, bone is built in ample amount to withstand the stress to which it is habitually subjected, being a labile structure built in accordance with need. Yet the alveolar bone of many persons is weak and seems incapable of withstanding the forces of ordinary mastication. If slightly weakened by gingival inflammation or by unaccustomed stresses, it melts away and leaves the tooth without support. During periods of illness or malnutrition, the teeth loosen. After recovery from the systemic defect, the teeth may tighten and remain in health. A number of systemic conditions seem to affect this phenomenon. Teeth tend to tighten in summer that were loose in the winter and spring. Internal glandular disturbances are potent causes of loosening of teeth. Periods of overwork or worry are frequently accompanied by loosening teeth.

How should we meet these conditions? Naturally, we should attack the fundamental cause. We should know what causes such a tendency to bone destruction and combat it with systemic therapy. Instead, we are forced, by the limitations of our knowledge and practice, to grind the teeth or build them up to relieve torsional stress and equalize function and to depend on the relief of irritation and on massage to restore the local health. It is remarkable that such good results are obtained by these means. Most cases that are not too far advanced will respond to the mechanical relief of strain and to vigorous local stimulation, provided the systemic disturbance is not too severe. While these local measures are necessary in any case, how much better it would be to get at the systemic condition and combat our ailment at its source!

It may be said that this is a problem for the physician; but we cannot thus evade our responsibility. It is a periodontal problem. The physician may find no other symptom of disturbance and knows nothing of dental pathology. It is a problem in periodontal research to discover the causes which render alveolar bone unstable and the means to build it up. Whether we subsequently choose to equip ourselves so that we may legally apply the knowledge which we gain or prefer to leave it to the physician to apply, we must develop the knowledge.

A great deal of work is being done on

the physiology of bone. The orthopedic surgeon can now almost make bone grow where he will. He has learned the requirements for the formation of bone and can cause it to form in muscle, kidney or bone wounds. This knowledge should be available to us. Were we able to cause bone to re-form in periodontal tissues from which it has resorbed, the means at hand for helping our patients would be wonderfully extended. Such a possibility is by no means remote. It can only come, however, from painstaking laboratory study and animal experimentation.

Research has come to be primarily a function of universities. With some notable exceptions, medical laboratory and even clinical research is all done in connection with educational institutions. The way is marked out for dentistry. Most of the essential problems in periodontology must be solved through bacteriology, physiology and pathology. Studies on these subjects must be conducted in fundamental science laboratories. Our dental educational institutions must become intimately associated with such laboratories. Undergraduate and graduate dental students and faculties should devote time and energy to the solution of the questions before us in these places. Our problems are not primarily matters of technic: they are matters of science. Only as we train scientists and give them opportunities for work can these questions which are so basic to rational practice be answered. The profession at large can do much by gaining an intelligent appreciation of these facts, and by bringing pressure to bear on educational institutions to the required ends.

WHY THE DENTIST NEEDS TO HAVE A KNOWLEDGE OF CERTAIN FUNDAMENTALS OF NUTRITION*

By ARTHUR L. WALTERS, D.D.S., Tulsa, Okla.

THE dentist of today should be capable of rendering a more complete service than can be covered by mechanical restorations and minor surgical work alone. It is expected that he be able to restore lost tooth structure, remove and replace lost teeth and recognize and remove pathologic tissue, but, in addition to this, he should also be capable of instituting prophylactic measures of such character as will reduce very greatly the necessity for restorative work. He should be able, through an applied knowledge of nutrition, to maintain the health of the teeth and their investing tissues, thereby reducing to the minimum required restorative work of any character, and, through the same medium, enable the patient to maintain this minimum need of restorative work for the maximum length of time.

Restorative work, regardless of its type, is almost wholly a mechanical science. Fillings, inlays, bridges and different types of dentures all may be successfully handled by any one who has the technical and mechanical knowledge combined with digital dexterity, but the re-

*Read before the Section on Partial Denture Prosthesis at the Seventy-Third Annual Session of the American Dental Association, Memphis, Tenn., Oct. 20, 1931.

quirements making possible the recognition and removal of pathologic tissues or structures, and the institution of successful prophylactic measures, are much greater.

The true scientific foundation for dental prophylaxis may be based only upon a knowledge of nutrition.

McCollum says: "The first step in reaching an understanding of the chemistry of the living tissues must involve the separation and study of their structural units." When this is done, we find that normal cells are composed of various elements and that they and the fluid in which they are bathed must contain these elements, and in proper proportion, if normal metabolism is to continue.

When nutrition is altered or interfered with, the cells undergo certain changes, the character of such changes being dependent on the form of nutritional disturbance. Thus, we see that the health of the cell, or the body, is dependent on nutrition, and that our diet plays a most important part.

That is to say, we learn that the health of any living cell, or organism, depends primarily on the food of the cell or organism. Animals, in eating, furnish their bodies the various substances required for cell metabolism, and when the diet contains all these substances, and the environment is what it should be for the particular animal under discussion, everything possible is being done to maintain that animal at the optimum of health. When the diet is faulty or the environment is unnatural, or both conditions exist, it becomes necessary for the animal to readjust itself to the changed condition, and, in so doing, certain changes may take place in the cells. Such changes, being abnormal, are designated as disease. Thus, we see that disease may be produced at will, either by interfering with nutrition, through a diet not adapted to the needs of the animal, or by changing the environment.

It becomes necessary, therefore, for dentists to know some of the fundamentals of nutrition in order to be able to render the broader service to which their patients are entitled. In the "Martyrdom of Man," Winwood Reade says:

> It is one of the first axioms of medical science that no one is competent to treat the disease of a single organ, unless he is competent to treat the diseases of the whole frame. The folly of dividing the diseases of such organs as the head and the stomach, between which the most intimate sympathy exists, is evident to the unlearned. For as the whole structure is united by delicate white threads, and innumerable pipes of blood, it is scarcely possible for any complaint to influence one part alone.

The foregoing quotation may not make a lasting appeal to the dentist who is content to serve his patients through the mechanical side of his profession only, but to him with vision of the broader field, it will serve as an inspiration, and he will have a greater appreciation of the research which has been done by such men as Howe, Price and Drain, who have gone far beyond the mechanics of dentistry.

I do not believe that it is essential for dentists to know, in detail, how to treat all disease in order to treat that of a single organ, but I do believe that dentists should be well enough grounded to recognize gross, or macroscopic, deviations from health, and to evaluate them as they relate to oral disease. I believe that most dentists do recognize and note these changes, yet do not seem to realize that most of the variations from normal (in the mouth as well as elsewhere) are the result of three things: (1) nutrition, (2) heredity and (3) environment, any or all of which enter into the etiology of every deviation from the normal. This carries

us back to the fact that we must know something of cell metabolism before we can make an intelligent effort toward combating the ravages of dental disease. Our success in practicing and teaching prevention (and in the main we should practice what we teach) will be in proportion to our knowledge of the constituents of normal cells, and the means which we as dentists may employ to maintain this normal, as well as the correct procedure when restoration to health is necessary after disease has manifested itself. If our problems as dentists could have been met by restorative work such as the placing of fillings, inlays, bridges or dentures, by minor surgical interference, by scaling, polishing, brushing, using dentifrices and antiseptics, we would at this time have no problems, for there never was a time in our history when the profession had so many sincere, capable and skilful operators; but teeth continue to decay and periodontal disease continues to manifest itself in the mouths of many of our patients, regardless of our restricted efforts. Our problems have not been solved by mechanical skill or minor surgery or the use of drugs, chemicals or the toothbrush; all of which is convincing evidence that there are important factors, other than external or local, in the problem which should receive our consideration.

All of us have seen apparently clean mouths that were very susceptible to caries or periodontal disease. Conversely, we have seen mouths positively filthy in which there was very little or no caries, and with the investing tissues in perfect health. We have seen carious teeth become immune and periodontal disease arrested with no interference on the part of the dentist and no oral treatment whatsoever. This must indicate there are causes other than local which wield a very great influence. Unquestionably, local conditions do play a part, but it is impossible to account for the so-called periods of susceptibility and immunity through consideration of external forces alone.

McCann says:

When man's house is built, its wonderfully organed inmate is constantly wearing and wasting away. Repair is necessary; incessant, never-ending repair. The repair materials are at hand. They are found nowhere but in food, in food alone.

No officer tolerates an unfit soldier. No business man tolerates an inefficient employe. No musician tolerates a jarring note. No physician tolerates incompatibles in his prescriptions, but in twenty million homes in the United States today there is complacent toleration for food abuses that sap the stamina of the race. . . .

Live stock and crops are fed according to fixed laws. Infants and children, men and women, are fed in ignorance and caprice.

Our daily food, less understood after years of agitation than the referendum or the fourth dimension, is so masked in mystery that scarcely one in ten thousand can give a definition of the phrase.

To the housewife, and those dependent upon her judgment for health and life, nothing is more vital, yet few are the homes in which the simple laws of nutrition are applied. The people no longer know the origin of their food or how it is prepared. They have lost control.

Babies are born every day and every day children are fitted for school. Though food is their first and most important necessity, its knowledge is chiefly confined to owners of stock farms, producers of prize sheep, horses, poultry, hogs and blue ribbon cows.

Intelligent herdsmen apply their knowledge of its meaning and measure results according to fixed operations when not deceived by the feed manufacturers. They know the growth, development and vigour of their animals depend upon the operation of clearly defined and inviolable laws.

They make a business of feeding for certain desired ends. To them pure food is not a mystery. It is the means whereby they supply proper building material to the physical needs of the creatures in which their money is invested; the instrument with which they pre-

vent disorder and sickness among their herds, flocks, kennels and litters.

But more often than not, these same intelligent herdsmen pay little or no attention to the kind of food served for their own consumption. They know what constitutes a balanced ration for their stock, be it cows, hogs or chickens, and see that they receive it. They know that sunshine, fresh air, pure water, exercise and rest are essential to growth and to the successful production of milk and eggs. They know that when nutrition and environment are what they should be, herds and flocks thrive, and by normal growth, increased milk flow and egg production, justify the extra expense and care. They know that when the abovementioned problems are carefully worked out and the surroundings are kept sanitary, liability to disease is reduced, and only the weaklings perish (which is according to natural law). They know that it is impossible to produce crops of superior wheat, oats, corn or any other crop on soil that has been partially depleted of the mineral elements; that if there is a dearth of these elements, the resultant crop will be inferior in quality and susceptible to disease, and will not justify the expense for seed and the labor involved. They know approximately the proportion of protein, fat, carbohydrate and the kinds of mineral salts and vitamins essential for the health and growth of their stock and will make every effort to learn whether there is an excess, or dearth, if the animal does not do well. They think, not in terms of drugs or medicines as related to the health of their animals, but in terms of nutrition, and they realize that nothing else can take the place of a balanced diet. They know the value of natural foods as related to animal husbandry, but seem unable to realize that they too are benefited or harmed by their own food and environment. Biologically, a primate, if man will select his diet as carefully as the keeper of the zoo selects foods for the monkeys, it is logical to assume that some of the benefits which accrue to the animals will also be his.

Howe has not only told us but has also actually demonstrated what takes place when monkeys are fed on a deficiency diet. The animal goes into a state of decline; certain symptoms are consistently manifest; and definite changes occur in the oral cavity, the teeth, their investing tissues and even the arch forms undergoing degenerative changes. Postmortems reveal the fact that these degenerative changes are not confined to the oral cavity alone, and Howe modestly tells us that this is "strongly suggestive" of what may take place in the case of human beings under similar conditions.

He also tells us that after the animal has manifested all the foregoing symptoms, he will be able to restore it to the optimum of health and maintain that optimum by the means of diet, and diet alone.

Drain tells us that he takes children after their bodies are racked and broken by disease, in much the same manner as are Howe's sick monkeys, and, through balanced diet, restores them to the optimum of health. Teeth that were undergoing decalcification recalcify, and, in actively carious teeth, the caries is arrested and the exposed, and softened dentin becomes exceedingly dense and immune to further carious action, this immunity persisting just as long as the child, through its diet, receives the various substances essential to proper nutrition.

The body is composed of a certain number of elements, about twenty-three in all, and research men have demon-

strated it to be essential that all these elements be available, if the body cells are to function normally. It should not be surprising, then, that we find disease so prevalent, since the most superficial investigation demonstrates that all these substances are very rarely found in the average diet. Again, there is the possibility that even though all the elements are present, they may not be in assimilable form or proper proportion. In other words, the diet is not properly balanced as to kind or amount of protein, fat, carbohydrate, mineral salts, vitamins and cellulose. Protein is absolutely necessary, for growth and repair of tissues, but any in excess of the actual bodily requirements works a hardship on the whole organism. As it cannot be stored in the body to any great extent, the excess must be eliminated quickly, else disease, or death, may result. Thus, the liver, kidneys and all the defensive organs are continuously overworked in their efforts to neutralize the toxins which flood the body as a result of excessive intestinal putrefaction.

Fat is not absolutely necessary in the diet, for the body can synthesize it from carbohydrate, but it adds variety and has considerable value in that it is a highly concentrated food and certain kinds are rich in vitamin content; and it therefore should enter into the diet in the proper amount. An excess not only tends to cloy the appetite, but is also conducive to intestinal putrefaction, and unless it is accompanied by the amount of carbohydrate necessary to its metabolism, the tendency to acidosis is increased.

Carbohydrate is very essential in the diet. When the requirements are estimated in terms of calories, at least 60 per cent of the diet should be carbohydrate. Less harm comes from overingestion of this class of food than any other. An excess of carbohydrate foods in their natural state, would probably mean overweight, with its attendant evils. Overingestion of refined carbohydrate foods, in addition to the danger of overweight, usually carries with it decreased consumption of the foods so essential to proper nutrition, for they satisfy the appetite without furnishing the body an adequate amount of nourishment.

Mineral salts and vitamins, in proper kind and amount, must enter into the dietary of every living animal, if normal growth and development take place. A dearth of any of these salts or vitamins means poor development, susceptibility to disease and untimely death. They enter into the composition of every cell and secretion. It is extremely doubtful that there is any possibility of overingestion of the mineral salts and vitamins if they are obtained in their organic state, and no author, as far as I know, has ever seen fit to warn against an excess.

One could write a lengthy paper on cellulose and the essential part it plays in the diet, the benefit derived from the consumption of an adequate amount and the harm resulting from a deficiency (I wish that Dr. Howe would tell you the part it played in maintaining intestinal tone in one of his monkeys), but I shall merely state that cellulose is represented by the framework of plants and the outer skinlike portion of fruits and cereals, the seeds of berries and the indigestible fibrous portion of fruits or plants. It is very necessary in the diet. An excellent illustration may be found in the wheat berry. Fully three-fourths of the mineral salts and colloids, including the salts of calcium, phosphorus, iron potassium, chlorin, fluorin, sulphur, magnesium, and manganese, are removed when we reject the outer skin, the cells immediately underneath this skin and the germ.

The same is largely true of all cereals, tubers and some fruits.

The muscles of the intestine are no different from those in other parts of the body: if they are to function normally, they must have exercise and there should be something for them to grasp. In order to lighten the food residue and make this possible, there must be an adequate amount of bulk in the food daily. There is more than one reason for constipation, but unless cellulose is present in sufficient quantity in the diet, we shall always have the evils of poor intestinal tone and drainage with which to contend, and just as long as we are dealing with a case of autointoxication, due to faulty elimination, we are dealing with an actual or potential case of caries, pyorrhea, or both; and why not, when the colon of the constipated person is actually teeming with virulent bacteria, constantly liberating deadly toxins? John Harvey Kellogg states that this type of colon is a veritable "Pandora's box" of disease. He is also authority for the statement that the bowels of the primates and uncivilized people move three or four times daily. Shortly after the intake of food, there should be a bowel movement; which is just another way of stating that if we eat three times daily, the bowels should move at least three times. The food residue of this morning's breakfast should be eliminated not later than after breakfast tomorrow morning. Anything short of this means constipation, and unless the mucous membrane of the colon is intact and capable of presenting an impenetrable barrier, the toxins, and often the bacteria themselves, enter the blood stream, and the result of such poisoning may manifest itself in various forms of disease. When we realize the evils of constipation and its resultant autointoxication, and recall that every blood vessel, every gland, every cell and secretion is altered, does it seem unreasonable to believe that our dental ills are largely influenced by the part nutrition plays in the health or disease of the oral cavity?

Foods rich in cellulose are a direct benefit to the teeth and their investing tissues. If cellulose is the broom which sweeps the colon clean, it is also Nature's toothbrush. If one will finish his meal with food or foods rich in this substance, he will appreciate this fact more fully. In addition to its detergent effect on the teeth, cellulose affords the exercise necessary for normal circulation of the blood in the periodontal membrane, without which this much abused tissue cannot long remain healthy or immune to disease.

It would seem that sufficient evidence has been submitted by workers in this field to prove that it is almost impossible to have any form of periodontal disease when the blood stream is normal and its circulation unimpaired; but it is not possible to have a normal blood stream unless the diet contains the essentials and the colon is freed of waste products of metabolism before their toxins are liberated and absorbed.

In dealing with oral disease, one should consider the type of micro-organic life involved. Individual idiosyncrasy or susceptibility should also be taken into consideration. In fact, one should be very careful not to underestimate the efforts of any research on any phase of dental disease, and he should always appreciate the fact that nutrition is basic. Procreation, growth, development, resistance and immunity all are influenced largely by nutrition.

Broderick says:

> It would appear that dental research still lingers in the bacteriological area, not that this by any means infers that the science of

bacteriology has nothing more to teach us, but it would appear that the biochemical conception of disease is necessary to explain the difficulties and to fill in the hiatuses which the study of bacteriology has left.

To quote from page 472 of the "Newer Knowledge of Nutrition" by McCollum and Simmonds:

In England and in America we are in a stage of progress where repair and cleanliness are goals toward which schools, authorities and parents are being urged to work. This is essentially trying to put an attractive superstructure upon a faulty foundation. In its present form this movement for the preservation of teeth is founded upon a plan which will call for more and ever more investment of time, money, and human effort without any prospect of relief from the burden. The senior author pointed out several years ago that the only prospect of relief from the present deplorable condition of the teeth in America was through giving attention to the problem of forming sound teeth during the period of growth. He stated that this involves the application of scientific nutrition to the regimen of the expectant and nursing mother and to the management of infants and children, and stated that without satisfactory prenatal nutrition the teeth of the child will be faulty.

If one believes with Tomes that the enamel possesses no compensatory power and is unaffected by internal conditions, with Miller that caries is a matter of acid liberating micro-organisms and with others that periodontal disease is due to local causes only, he will continue to practice dentistry as a mechanical science, and will not seriously interest himself in anything having to do with the biochemical conception of disease; but if he is unwilling to accept such postulates and will give the subject of nutrition earnest consideration, with McCollum, Sherman, Kellogg, Howe, Drain and others, as his guides, he will, in addition to the splendid mechanical service so essential to the comfort of his patients, be in a position to render a health service of vital importance.

Medical & Dental Arts Building.

DISCUSSION

C. L. Drain, Iowa City, Iowa: Dr. Walters has considered a subject the significance of which has been recognized only within the past few years; a subject which the dentist must study if he would render the best type of health service. He has given the reasons that we should be familiar with the fundamentals of diet. I should like to discuss the nature of the diets which have proved of value in our hands in the control of dental caries. The first point worthy of emphasis is that menus of various types have proved satisfactory in varying degrees for this purpose. One group of children received a diet in which most of the calories were supplied in the form of fat, carbohydrate being reduced to the lowest point of safety. The menus of these children consisted essentially of the following: milk, cream, butter, eggs, the coarser fruits and vegetables, meat and cod liver oil. The nature of the disease in this group made it necessary that they receive weighed diets and that they clear their plates at each meal. The arrest of caries was most prompt and consistent with this group of children. With another group, the disease present required that they receive a diet very low in fat, the energy being supplied as protein and simple sugars. Their menus consisted of skim milk, cottage cheese, eggs, ground meat, orange juice and cod liver oil; as the severity of the disease lessened, certain sieved fruits and vegetables were added in limited amounts. The arrest in this group was as marked as in the foregoing, but did not occur so promptly. Of interest, and in contrast to these two groups, is the response of ten preschool children. In each instance, the dietary was carried out by the mother in the home, and while it required a longer time to arrest caries in some cases, in ultimate effectiveness it was very satisfactory. Since that time, during the past few years, it has proved adequate for control in more than 300 cases. The dietary is less restricted than the preceding, but specified that the following foods should be included in the daily menu: one quart of milk, at least one egg, two servings of vegetables, two servings of fruit, one of which should be fresh, one teaspoonful of cod liver oil, one serving of fish, liver, chicken or meat, and six teaspoonfuls of butter. A survey of several orphanages, as yet unpublished, has revealed that a diet of very low cost, and consequently one restricted in many respects, is quite ade-

quate in the prevention and control of caries. The incidence of caries in these groups is considerably less than in the average public school population of similar age. The menus employed in these institutions utilized starches as the chief sources of calories, together with an abundance of milk and coarse vegetables and fruits, but with restricted supplies of meat and eggs, and little or no cod liver oil. In correlating the results obtained by these diverse types of diet, two points are outstanding: The greatest success was obtained when the food intake was most thoroughly controlled. In the sick children, this was necessary because of the nature of the disease. The orphanage children were required to clear their plates as a matter of food economy. Secondly, with the exception of the orphanage groups, these various types of menus were designed in each instance to furnish all the constituents of a complete diet, even though the nature of the foods varied, depending on the requirements of the child's condition. With the orphanage group, deficiencies of diet were offset largely by the fact that the children cleared their plates three times a day. These observations might be taken to indicate that our goal should be to recommend diets complete in all respects rather than those designed to arrest or control dental caries. When the diet is wisely chosen to satisfy the body's needs rather than to appease an artificial appetite, or to conform with some fad, fancy or advertising propaganda, we may expect dental caries to be an infrequent finding.

ARTISTIC ASPECTS OF DENTISTRY

By JOSEPH BISAHA*

THE artistic problems of dentistry are far from being identical to the problems of the fine arts. *Ars gratia artis*—art for the sake of art—cannot be applied to dentistry. By all means, it has to be modified to read, "art for the sake of health."

The chief aim of fine arts is to please, to entertain, to inspire; to glorify the beautiful, and to express it in the light of the contemporary conception of esthetics. Esthetics, which is the theory or philosophy of taste, is a variable factor in the history of fine arts. The beautiful of yesterday is a source of merriment of today. The esthetics of the Renaissance required the artist to be realistic, to reproduce action, strength, perspective, harmony of color, tone and contour; the esthetics of the Byzantine era required the artist to represent a princely figure of several times the size of his subjects; a saint was unimaginable without a halo.

The modern concept of esthetics sets scarcely any limits to the fine arts, the artist's fancy being his only limitation. The fine arts are self-sufficient and the motto *Ars gratia artis* meets with universal approval. We do not expect the artist to be truthful or slavishly faithful in his representation of Nature. We are well aware of his privilege to add, omit, distort or idealize for the sake of art.

Dental art presents an entirely different picture. The very limitations imposed on it preclude its classification among the fine arts. As I have pointed out, the standard of esthetics in fine arts is a variable factor and therein are crystallized the cultural, economic, political, religious and geographic conditions of an era, or of a nation. The standard of esthetics in dental art, on the other hand, is a con-

*Senior student (1930-1931), School of Dental and Oral Surgery, Columbia University.

Jour. A. D. A., February, 1932.

stant factor, and dental art is limited in its evolution to a faithful reconstruction of the teeth and gums, within the normal, and their harmonious relation to the face. And once that stage is reached, it will have crystallized itself, theoretically speaking, into a fixed, standardized craft.

Let me impress on you one fundamental truth, and that is that the artistic aspects in dentistry must at all times remain subservient to both the physiologic and the mechanical aspects. Let us remember that the application of art in dentistry is justified only as it serves to promote the physical or mental well-being of an individual. It must at all times be useful and strictly purposeful, as was Nature itself, which dental art proposes to reproduce. Attempts at art in dentistry at the expense, however slight, of biologic considerations are less than useless: they are repulsive; because, after all, our ideals of dental esthetics were derived from observation and careful study of the soft and hard tissues as they exist in physiologically, anatomically and mechanically well-functioning oral cavities. And so our esthetic conception of the ideal tooth, of the ideal gums, of the ideal occlusion, of the ideal alinement of teeth, etc., is dependent on the normal function of the mouth. Therefore, dental art is a direct outcome and an integral part of dental health.

To say that Nature always attains the highest degree of beauty when the mechanical and physiologic conditions are most favorable is true, and is next to saying nothing in so many words. I do not see how Nature could help it, since it was instrumental in building up those esthetic ideals under just such favorable conditions.

There were times when dental esthetics was not what it is today. The earliest dentistry practiced in America was on a purely artistic basis. Let us see what happened. In pre-Columbian times, the natives of Central America operated on the tooth by staining, filing or cutting the ends into different forms, and by the insertion of foreign substances in or through the enamel. Decorative inlays of turquoise, gold, etc., have been found in skulls dug up in Mexico and Yucatan. The work was done mostly by women. (It would seem that woman was the earliest authority on dental esthetics.)

Dental esthetics requires the ability to see and appreciate the beauty and harmony of the human face and to understand the importance of the teeth and the bony structures in the production of facial contour and character of expression. In some, this ability is innate; others have to develop it by careful study, observation and training. There are certain fundamental principles—common to all arts—with which we must be familiar to a certain extent before we can create artistic effects. Sir Joshua Reynolds says:

> The arts would lie open forever to caprice and casualty, if those who are to judge of their excellence had no settled principles by which they are to regulate their decisions, and the merit or defect of performances were to be determined by unguided fancy; and indeed we may venture to assert, that whatever speculative knowledge is necessary to the artist, is equally and indispensably necessary to the connoisseur.

And again John Vanderpoel, a well known authority on art, says:

> Rules have been laid down by which an ideal standard has been sought to be fixed, the deviation produced by age and sex being taken into consideration, and while such standards are more or less artificial, and not to be slavishly followed to the extent of producing an unnatural uniformity, they certainly are invaluable as expressing a means, which cannot be deviated from to more than a limited extent, without transgressing the laws of nature and producing deformity.

It is on the sensitiveness of the nervous system, whether natural or acquired, that

the sense of beauty depends, and, therefore, we have to cultivate our sense of beauty in general, so that we may apply it in particular. Studies in drawing, painting, carving and chromatics would afford invaluable training in developing perception for facial types, and harmony of form and color. J. Leon Williams made an invaluable contribution to dentistry in his classification of faces into three typical forms, showing the harmony, by analogy, existing between them and the three typical tooth forms. We know now that the square arches and square alinement of teeth are found in square types of faces; the tapering arches and alinement in tapering faces, and the ovoid arches and alinement in ovoid faces.

We have to get into the habit of studying human faces and of searching and discerning features which lend the individuality to a face and those which are common to all faces. By searching, our discriminating power becomes acute; we shall be able to avoid the "almost nothing that will mar everything."

No system yet has been devised which will automatically bring perfection. Nothing can relieve the operator of the responsibility for cultivating his esthetic sense, which will enable him to visualize a harmonious combination. Whatever the system, it is merely an aid, a means of approach to the correct solution of the problem of the dentofacial harmony which every individual case presents. A successful result depends, in the last analysis, on the mature judgment of the operator, his cultivated artistic sense, which, by exercise and experience, becomes in time almost intuitive.

I should like to summarize this discussion on dental art as follows:

1. It is a useful art, and by no means a fine art.

2. It forms an integral part of dental health and, therefore, no dental restoration to health can be considered complete unless the artistic aspects as well have received expert attention.

3. Therefore, those who, in their interest in biologic aspects of dentistry, underestimate or even lose complete sight of the artistic aspects, and those who, because of a lack of preparation, see nothing but the artistic end of dentistry, are equally guilty of a misinterpretation of the true nature of dental art.

The Journal of the American Dental Association

212 East Superior St., Chicago, Illinois

C. N. JOHNSON, Editor

Published by the American Dental Association

All expressions of opinions and all statements of supposed facts are published on the authority of the writer over whose signature they appear, and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by the Association.

Communications intended for publication in the scientific or literary pages of THE JOURNAL should be addressed to the Editor. All advertising or business matters should be sent to the Business Manager.

Subscription is included in the annual membership dues. To nonmembers living in the United States or its possessions, the price is $2.50 a year in advance; Canada, $3.00; Australia, $4.00; other countries, $3.25. All foreign subscriptions are to be paid in United States money.

Editorials

DENTAL SERVICE FOR THE WORTHY

Very often, we hear the statement that the average person cannot afford the proper dental care because dental service is so expensive. Analysis of this statement reveals the real truth of the matter, that the average person objects to paying for the necessary medical and dental service.

The fact remains that few people are so situated that, because of a limited income, they cannot secure the necessary dental or medical attention. It is these few persons who seem to be attracting all the attention of social workers and other persons who are contending that dental and medical service is too expensive for the average person. Around these people is built the argument for health insurance and panel dentistry. The medical and dental professions must recognize this condition, and if health insurance and panel dentistry are to be avoided, the profession must suggest some plan that will make dental service available to these finan-

cially embarrassed people on a basis as economical as health insurance would be.

Several suggestions have been made whereby the dental profession could provide service for these unfortunate people. As a result of these various suggestions, a plan is now being introduced in the First District Dental Society of New York State as follows:

The members of the First District Dental Society of New York State signify their intention to render service to worthy persons. These patients are treated in the dentist's office during such hours as the dentist sets aside. This plan appeals especially to the younger dentist who has considerable vacant time. It enables him to reduce his overhead and also render a service to people who cannot pay the usual dental fee. The list of dentists who are willing to take care of these worthy patients is recorded in the office of the secretary of the First District Dental Society of New York State.

The society sets the fee that is to be charged for certain work, which, of course, is intended to relieve the immediate needs of the patient. The advantage of this plan is that the list of dentists is controlled by the First District Dental Society of New York State, and the fees charged are also determined by the society. In fact, the entire plan is controlled by the profession from beginning to end.

Under the health insurance plan, the patient pays a certain amount of money to the company or society. Out of this sum, the company or society pays the dentist a certain fee for his service and also takes a certain amount of the money for administrative expenses. An analysis of health insurance plans reveals the fact that not more than 60 cents of the dollar which the patient pays the insurance company or society is ever paid out for dental and medical service. About 40 per cent is used for administrative expenses.

According to the plan placed in operation by the First District Dental Society of New York State, every cent of the money which the patient pays goes for dental service. None of the patient's money is used for administrative expenses; an economic advantage.

Besides, this plan not only provides a service to the people who cannot pay the usual fees but also makes provision for immediate dental service to these people who are unemployed.

Cooperating with the First District Dental Society of New York State are various charitable organizations which investigate these patients as to their worthiness.

While the plan has been under operation only a short time, it has already been demonstrated that people are trying to obtain this dental service who are not entitled to it. This seems to be one drawback to any plan that attempts to provide the worthy with medical or dental service at reduced cost.

In the face of the fact that various social workers and insurance companies are advocating health insurance, it is our belief that the plan being followed by the First District Dental Society of New York State will do more toward eliminating the agitation for panel dentistry and health insurance than any other plan that has been suggested.

M. D.

THE PROBLEM OF DENTAL CARIES

All down the line, for more than a century, various investigators have been at work trying to solve the problem of dental caries. From Robertson, in 1828, to Miller, Black, Williams, Howe, Bunting, Drain, Bödecker, Pickerill, Wallace, Mellanby, and scores of others, at home and abroad, there has been an earnest endeavor to clear up this perplexing disease, and much light has been thrown on it.

But we are far from an exact knowledge of the really significant entity that actually causes cavities in teeth. Robertson indicated that the carious process was the result of some influence acting directly on the enamel at certain points where the cavities were to occur, and not the reaction of saliva that did the damage. Miller demonstrated that, with an acid, which he determined was lactic acid, he could bring about caries artificially that could not be distinguished from caries that took place in the mouth. Immedi-

ately, the sky began to clear and it looked as if the sunshine of truth was soon to reveal the whole story; but the prevalent "variable winds" of the weather bureau were soon duplicated by the variables in the caries question. The teeth of some individuals did not decay, while those of others did, and the confusing thing was that the micro-organism of decay could be found in all mouths, immune or susceptible. At first, the natural inference was that the teeth of some individuals were soft and those of others were hard, which accounted for the variation. This was soon proved a fallacy, because it was found that there was relatively little difference in the ratio of organic and inorganic material in the teeth of different individuals. In the chemical analysis of the teeth of all classes of people, there was demonstrated a great uniformity of percentage; and not only that: the percentage did not materially change in a given mouth even though there was manifest at different times in the same mouth a great variation in the tendency to decay.

During recent years, the influence of diet has been emphasized by many writers, and much information has been gained on the subject; but, with all of it, no one has yet told us the complete story of dental caries. We do not know why one mouth is susceptible and another immune. The answer assuredly does not hinge on the question of cleanliness or uncleanliness. Doubtless, much benefit is derived from keeping the teeth as clean as possible whenever there is a tendency to decay; but it is a well known fact that there are some mouths in which decay is not present in the face of the most appalling neglect, and others where decay assails the individual despite the best care that can be given the teeth.

There is something deeper seated and more subtle than has ever yet been pointed out in the manifestations of this disorder. That it is not merely a matter of diet is demonstrated by the fact that two individuals using similar diet will often show pronounced variations in the incidence of caries. As has just been said, it is not a question of tooth tissue, because there is no such variation in tooth structure as there is in the manifestations of decay. And it is not a matter of cleanliness or uncleanliness.

The fact is that we have not yet put our finger on the significant

thing in the causation of this condition. What is it? Till we know more about this missing factor, we shall never intelligently combat dental caries. Prevention is termed the keynote of the hour, but we shall never prevent dental decay till a better answer has been given to the question as to the varying manifestations of this disease as we see it day after day.

In those cases in which a certain diet given a group of children has resulted in a marked immunity, as has been demonstrated under experiment, it is still pertinent to ask why. What is the determining factor in the improved condition? What change has been made in the mouth or in the system to bring about a cessation of the carious process? With other diseases, such as tuberculosis, smallpox and cholera, we know the specific cause; but with dental caries, the most prevalent of all human diseases, we are still baffled. And when we see the widespread incidence of caries that is so generally manifest, we are more and more impressed with the crying need for a concrete solution that shall start us on a more direct road toward prevention.

Prevention is our ultimate goal, but before we can achieve prevention, we must surmount the seemingly insuperable barrier that presents itself in our lack of knowledge concerning the one thing that really determines whether we shall find cavities in our teeth.

UNDIGNIFIED PUBLICITY IN DENTAL SOCIETY PROGRAMS

There seems to be a growing tendency toward the display of undignified publicity in the programs of some of our dental societies, and while it may be permissible to introduce certain features of a striking and even a spectacular nature in order to attract attention, there is little to be said in defense of the grotesque attempts at caricature that have been displayed in connection with some of our recent publications. This is all done with the best of intent to relieve the monotony of such literature and to produce something that will entertain the members as well as instruct them, but in the laudable attempt to provide a pleasing diversion and

introduce entertainment, the idea has been carried so far as to partake of a species of buffoonery that borders strongly on the objectionable, and that tends to detract from the dignity and respect which should accompany all of our professional activities.

In the quite recent past, a great deal of criticism on the part of the profession was engendered against the daily press whenever a dental meeting was held, through a tendency to caricature dentists and their activities. It required quite a concerted pressure to curb this tendency, but eventually the members of the press recognized the impropriety of thus holding up the profession to public ridicule, and latterly we have very rarely seen instances of any impropriety of this kind. For this very commendable willingness on the part of newspaper men to respect the wishes of the profession, we are under deep obligation; and shall we minimize all the advantage that we have gained and open ourselves to the charge of inconsistency by indulging in the impropriety of admitting such material to our professional publications?

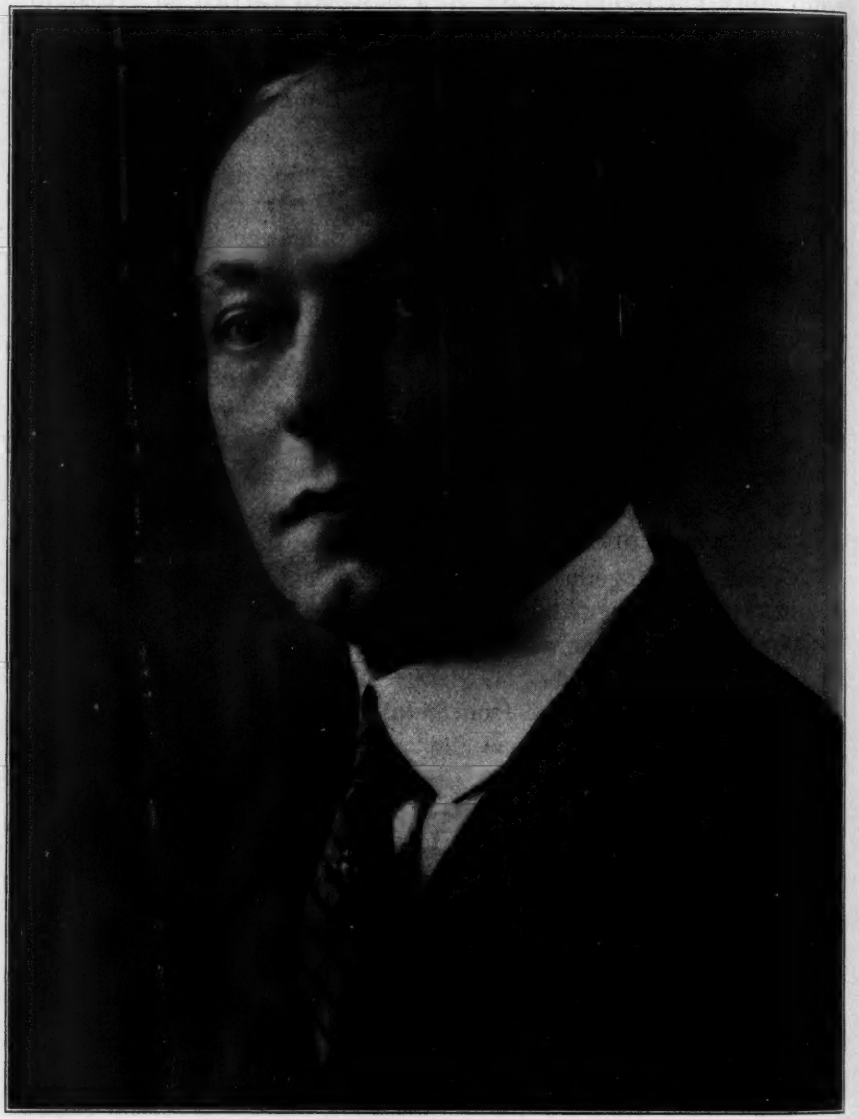
There is altogether too great a tendency on the part of the public to poke fun at the professions, and sometimes to hold them up to ridicule, and it will do us little good to encourage this propensity in our own ranks. Let us get all of the fun out of life that we can, but let us refrain from indulging in fun at the expense of our own professional respect and reputation.

EDWARD HOFFMEISTER, A.B., Phar.G., D.D.S.

(1870-1931)

Edward Hoffmeister was born in Baltimore, Md., Dec. 9, 1870. He received his preparatory schooling in the Baltimore City College, then entered the Johns Hopkins University, from which he graduated with the bachelor of arts degree. He continued his study in the University of Maryland, School of Pharmacy, where he received the degree of graduate in pharmacy. He then entered the Baltimore College of Dental Surgery, from which he graduated in 1894.

Immediately after his graduation from the Baltimore College of Dental Surgery, he was appointed instructor in chemistry and he later became assistant professor of the subject under the late William Simon, who paid tribute to Dr. Hoffmeister's aid in the preparation of his textbook, "Simon's Chemistry." He soon was made professor and head of the department of materia medica, therapeutics



EDWARD HOFFMEISTER, A.B., Phar. G., D.D.S.
1870-1931

and pharmacology in the Baltimore College of Dental Surgery, in which capacity he continued until his death. The high regard in which he was held by a vast concourse of former students testifies to his unusual ability as a teacher.

Dr. Hoffmeister was quiet, reserved, courteous and kind at all times, preferring to carry on his service to the profession through the benefits which students might derive from instruction received at his hands. He never aspired to recognition of his abilities beyond the simple fact of doing his duty promptly, carefully and thoroughly.

He retired from active practice about a year ago, but continued teaching. He was a member of the Baltimore City Dental Society, the Maryland State Dental Society, the American Dental Association, the Alumni Association of the Baltimore College of Dental Surgery, a Mason, a member of Friends Meeting House, and a member of Xi Psi Phi and Omicron Kappa Upsilon fraternities.

He is survived by his wife, Mrs. Katherine Hoffmeister; a daughter, Mrs. George Seidel, Selinsgrove, Pa., and two sons, J. Edward Hoffmeister, professor of geology, University of Rochester, and William S. Hoffmeister, geologist for a petroleum company at Maracaibo, Venezuela.

J. Ben Robinson.

THOMAS LEWIS GILMER, D.D.S., M.D., Sc.D., F.A.C.S.

(1849-1931)

Thomas Lewis Gilmer was born in Lincoln County, Missouri, Feb. 19, 1849. He attended New Hope Academy, Lincoln County, and Woodhull Academy, Scottsville, Ill. He graduated from the Missouri Dental College, St. Louis, 1881, and from the Quincy College of Medicine in 1885.

Dr. Gilmer practiced dentistry in his father's office in Lincoln County for a few months and then moved to Waverly, Ill., where he practiced four years. He later moved to Quincy, where he practiced from 1876 until 1889; when he moved to Chicago.

The record of the Gilmer family in the practice of medicine in America is unique. Dr. George Gilmer began practice in Williamsburg, Va., in 1731, forty-five years before the Revolutionary War, and through successive generations members of this family have been in practice, Dr. Thomas L. Gilmer having completed this service through the 200th year.

Dr. Gilmer received the honorary degree of doctor of science from Northwestern University in 1912 and was made a fellow of the American College of Surgeons in 1913. He served as oral Surgeon on the staff of St. Luke's Hospital from 1889 until his death. He was president of the Illinois State Dental Society in 1881 and also had served as president of the Institute of Medicine in Chicago.

Dr. Gilmer was chairman of the group that organized Northwestern University Dental School in 1891 and served as professor of oral surgery for many years.

In 1868, he was married to Ella M. Bostick of Scottville. He is survived by

a daughter, Mrs. W. V-B. Ames, of Libertyville, Ill., and two grandchildren, Lewis B. Gilmer, of Lindhurst, N. J., and Frank B. Gilmer, of Chicago.

Dr. Gilmer enjoyed the experience of almost fifty years of intimate contact with that foremost dental teacher and author, Dr. G. V. Black. In 1922, the Illinois State Dental Society tendered a joint banquet to Dr. Gilmer and Dr. Edmund Noyes on the completion of a half century of membership in and service to that society. Both joined in 1872, the year of the great Chicago fire, and they were most intimate professional and personal friends during that long period. Dr. Noyes had missed but three of the fifty state society meetings and Dr. Gilmer but two.

Dr. Gilmer's death occurred December 28. He had driven with his daughter, Mrs. W. V-B. Ames, to her winter home near Phoenix, Ariz., and it was their plan to drive to California for the Christmas holidays. After their plans were made, Dr. Gilmer was asked to make an address at a Northwestern alumni banquet in Phoenix, so Mrs. Ames drove on to California. He took a plane later, flying from Phoenix over the mountains to Los Angeles, where he joined his daughter. He later told Mrs. Ames that this trip was one of the most enjoyable things that he had ever experienced. He enjoyed their drives around the Los Angeles district and was in excellent spirits and felt unusually well at dinner Christmas night. When he failed to appear at breakfast the following morning, it was discovered that he was in an unconscious state, having had a cerebral hemorrhage some time during the night. He never regained consciousness and died within forty-eight hours.

Services were held January 2, in the library of the Northwestern University Dental School. Dr. R. A. White, an intimate friend of Dr. Gilmer's for many years, conducted the funeral service. Interment was at Libertyville, Ill., where Mrs. Gilmer and Dr. W. V-B. Ames are buried.

It is said that Dr. Gilmer probably contributed more than any other person to the development of the methods so extensively used in the World War in the treatment of fractures and other injuries to the jaw bones. He was also the first to isolate the bacteria of dental abscess, an important development in the study of systemic diseases resulting from infection about the teeth.

F. W. Gethro.

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The following articles have been accepted as conforming to the rules of the Council on Dental Therapeutics of the American Dental Association for inclusion in the list of Accepted Dental Remedies. The Council desires dentists to understand that the admission of an article does not imply a recommendation. A copy of the rules which govern the Council in the consideration of articles will be sent on request.

SAMUEL M. GORDON, *Secretary.*

FIBRIN FERMENTS AND THROMBOPLASTIC SUBSTANCES

Thromboplastic substances and fibrin ferments were introduced into medicine about fifteen years ago as aids in hastening the coagulation of blood. Preparations of this nature were introduced for local and intravenous use. In the meantime, evidence has been accumulating that their intravenous use almost always presents grave danger; nor is there satisfactory evidence that they are effective when introduced subcutaneously. It seems improbable that when used in this way they are of any value in controlling hemorrhage. It is possible that local application may be of some value. (In this connection, the Council desires to point out that intravenous medication is in general fraught with many dangers. These dangers, anaphylaxis, shock, etc., are too great to compensate for the claimed advantages of this type of drug administration. Since intravenous injection of drugs disturbs a delicately balanced physiologic equilibrium, the Council suggests that this type of medication be resorted to only in cases of the gravest emergency, such as shock arising from certain anesthetic actions, and that it be used only when other measures have absolutely failed.)

The clotting of blood may be regarded as the transformation of the fibrinogen of the circulating blood into the insoluble protein material, fibrin, of the blood clot. Different views regarding this phenomenon have been advanced from time to time. It is generally agreed that the clotting of blood is due to the action of thrombin (the fibrin ferment) on the fibrinogen of the blood.

Thrombin exists in the blood not as such but as prothrombin (the precursor of thrombin), which, when acted on by the calcium salts of the blood, is converted into the active agent, thrombin. (This explains why oxalated blood does not clot; a fact of importance in blood chemistry.) Other factors in addition to calcium salts are necessary for clotting, since normal blood contains a sufficient amount of calcium salts, yet spontaneous clotting does not occur in the blood vessels, except in certain pathologic conditions (thrombosis, etc.)

This other factor has been designated as "zymoplastic substance" by Schmidt, as "thrombokinase" by Morowitz, and as "thromboplastic substance" by Howell, who holds that blood does not coagulate in the vessels, since prothrombin exists there in combination with an inhibiting substance which prevents it from acting. He believes that when blood is shed or flows over injured tissues, the thromboplastin derived from the blood cells, platlets or tissue cells, reacts in some undetermined manner with the inhibitor, liberating prothrombin from combination with the inhibiting agent. The liberated prothrombin activated by the calcium salts converts the fibrinogen into fibrin, and initiates clotting.

Howell has shown that thromboplastin or "thromboplastin substance" from every source which he has investigated contains the phospholipid cephalin (see any standard textbook on physiologic chemistry) and that the accessory action of thromboplastin in coagulation is due to the action of cephalin.

Cephalin (or kephalin) is soluble in ether, but insoluble in acetone or alcohol. In a solution or in solid form, cephalin gradually loses its power to hasten clotting of blood, owing, probably, to an oxidation of the unsaturated fatty acids in the molecule. Because of this deterioration, only those products which bear a date of labeling should be used.

Actions and Uses: Preparations containing thromboplastin are said to be useful when applied locally in the treatment of hemorrhage, especially hemorrhages from local surfaces and specifically after the extraction of teeth. It is also said to be useful in the treatment of scar tissues, in nose bleed and in surgery. It is reported that many surgeons are abandoning its use. It may well be questioned if simple mechanical means do not in most cases bring about a desired clotting action.

The intravenous administration is dangerous, and the subcutaneous administration is irrational, as there is no satisfactory evidence that such administration is useful.

Preparations should be standardized by testing on specimens of blood *in vitro*. Acceptable preparations should be able to reduce the coagulation period to about one-third of the original time; and they should be proved sterile.

In view of their acceptance by clinical dentists for local administration, the Council will accept thromboplastic preparations for inclusion in A. D. R. provided they are marketed with claims limited to their local application.

THROMBOPLASTIN LOCAL—SQUIBB.—An extract of cattle brain in physiologic solution of sodium chlorid prepared according to the method of Hess. It complies with the product solution brain extract in physiologic solution of sodium chlorid prepared by the method of Hess (*J. A. M. A.*, 66:558 [Feb. 19] 1916, Footnote 2).

Actions and Uses: Thromboplastin-Squibb, like other fibrin preparations, is useful when applied locally in the treatment of hemorrhages, particularly on the oozing surfaces and in hemorrhage following extraction of teeth. It is applied by means of sterile tampons saturated with thromboplastin. (See foregoing paragraphs, "Fibrin Ferments and Thromboplastic Substances.")

Dosage: See "Solution Brain Extract" (to be published).

Thromboplastin-Squibb is marketed in 20 c.c. vials. It is claimed that no loss of potency could be detected in unopened thromboplastin-Squibb more than three days old.

Manufactured by E. R. Squibb and Sons. No U. S. patent or trademark.

Blood plasma is obtained by bleeding 45 c.c. of sheep's blood into a tube containing 5 c.c. of 1 per cent sodium oxalate in physiologic solution of sodium chlorid, centrifuging the mixture to obtain the clear plasma and preserving this at a low temperature. A 0.5 per cent calcium chlorid solution is prepared by dissolving 0.5 gm. anhydrous calcium chlorid in 100 c.c. of physiologic solution of sodium chlorid. Place 5 drops of blood plasma in a flat bottomed vial, add 3 drops of calcium chlorid solution and 2 drops of the thromboplastin-Squibb to be tested and mix the contents by gentle rotation. Not more than sixty seconds should elapse before the vial may be completely inverted without loss of its contents.

VIOSTEROL IN OIL 250-D, SQUIBB. A brand of Viosterol in oil 250-D, N. N. R.

Actions and Uses: See Viosterol (THE JOURNAL, 18:1786 [Sept.] 1931).

Dosage: See Viosterol (THE JOURNAL, 18:1786 [Sept.] 1931).

Manufactured by E. R. Squibb and Sons, New York, under U. S. Patent 1,680,818 (Aug. 14, 1928, expires 1945), by license of the Wisconsin Alumni Research Foundation.

Viosterol in Oil 250-D, Squibb is prepared by dissolving ergosterol in ether. The solution is then irradiated by exposure to ultraviolet rays. After assay of the irradiated ergosterol for its antirachitic potency, it is dissolved in maize oil and adjusted to have the potency of viosterol in oil 250-D, N. N. R.

SQUIBB'S COD LIVER OIL WITH VIOSTEROL 10-D. A brand of cod liver oil with viosterol 10-D, N. N. R.

Actions and Uses: See Cod Liver Oil with Viosterol 10-D (THE JOURNAL, 18:1787 [Sept.] 1931).

Dosage: See Cod Liver Oil with Viosterol 10-D (THE JOURNAL, 18:1787 [Sept.] 1931).

Manufactured by E. R. Squibb & Sons, New York, under U. S. Patent 1,680,818 (Aug. 14, 1928, expires 1945), by license of the Wisconsin Alumni Research Foundation.

Irradiated ergosterol, prepared by the method described under viosterol in oil 250-D Squibb, is added to cod liver oil and the finished product is required to have a vitamin A potency of not less than 500 pharmacopeial units and to have the vitamin D potency of cod liver oil with viosterol 10-D, N. N. R.

SQUIBB'S COD LIVER OIL WITH VIOSTEROL 10-D MINT FLAVORED.—A brand of cod liver oil with viosterol 10-D, N. N. R., containing 0.67 per cent of oil of spearmint as flavoring.

Actions and Uses: See Cod Liver Oil with Viosterol 10-D.

Dosage: See Cod Liver Oil with Viosterol 10-D.

Manufactured by E. R. Squibb & Sons, New York, under U. S. Patent 1,680,818 (Aug. 14, 1928; expires 1945), by license of the Wisconsin Alumni Research Foundation.

Irradiated ergosterol, prepared by the method described under viosterol in oil 250-D Squibb, is added to cod liver oil containing 0.67 per cent of oil of spearmint as flavoring and the finished product is required to have a vitamin A potency of not less than 500 pharmacopeial units and to have the vitamin D potency of cod liver oil with viosterol 10-D, N. N. R.

KOLYNOS DENTAL CREAM—NOT ACCEPTABLE FOR A. D. R.

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Kolynos Dental Cream was presented to the Council by the Kolynos Company, New Haven, Conn., for admittance to Accepted Dental Remedies.

The composition of the product is stated to be:

Alcohol	18.87 per cent
Thymol	0.21 per cent
Saccharin	0.35 per cent
Oil of eucalyptus	1.30 per cent
Oil of peppermint	1.42 per cent
Benzoic acid	0.22 per cent
Glycerin	28.63 per cent
Soap	20.00 per cent
Chalk	29.01 per cent

The composition reveals no ingredient or combination of ingredients that may be directly harmful. While there is a great deal of discussion in the dental literature bearing on the beneficial and harmful effects of soaps in various amounts, there is no acceptable evidence that tooth pastes containing soap to the extent of 20 per cent are harmful. Neither is there any pointed evidence available that it is beneficial to the soft or hard tissues of the mouth, or that it acts as an efficient cleansing agent.

As the present objective of the Council in the judging of dentifrices is pointed toward improvement in the present, often ridiculous, advertising of dentifrices in general, the question of acceptability therefore devolved on the acceptability of the claims made in advertising. The Council desires to point out that up to now there has been little critical evidence to determine even the relative truthfulness of the statements in dentifrice advertising. As a consequence, advertisers have claimed for their products other effects than what could reasonably be expected from a dentifrice, until the original functions of a tooth paste were lost sight of. This, in part, is the rationale of the Council's liberal provision for dentifrices.

Current or recent advertising of Kolynos Dental Cream is based on several premises, among them that Kolynos used according to the "dry brush" technic will whiten teeth fully three shades in three days, and that the paste has germicidal qualities. The undignified expression "ugly bacterial mouth" is featured in their advertising.

In order to determine by objective data the validity of the "three shades lighter" claim, the South Bend (Ind.) Dental Society, under the direction of

Harold T. Dailey, formerly instructor in pharmacology and oral surgery at Northwestern University, subjected the claim to objective tests. The method and results briefly were: The shades of the teeth of seventy-three subjects were measured against a Twentieth Century shade guide at the first presentation of the subject. The patient was definitely instructed to brush his teeth according to the directions appearing in newspaper advertising on Kolynos headed "Three Shades brighter in Three Days." On the third day, the shade was again measured. The results of the different observers were collated. Of the seventy-three cases reported, seventy-two showed no change in shade at all. The remaining case reported by one dentist showed perhaps a bit lighter, but to give the advertisers the benefit of the doubt, one shade lighter was reported.

The evidence for the germicidal claims of Kolynos rests on a series of unpublished reports made for the Kolynos Company. The figures indicate that brushing with Kolynos Dental Cream removes a larger number of "bacteria" from the mouth than does the use of the toothbrush alone. The important point, which seems to have been overlooked, is that none of these methods give a figure on the number of bacteria present in the mouth, nor, as far as the Council is aware, is a method available to afford this information.

More recent newspaper advertising for Kolynos Dental Cream carries the obviously misleading phrases: "It kills the millions of germs that destroy teeth and gums—190 millions in 15 seconds. It quickly neutralizes the acids that cause decay, gently erase tartar. . . ." Thus, all worry is banished. These statements need not be seriously commented on except to reproduce the stated opinion of Dr. J. J. Durrett, formerly chief of drug control, Food and Drug Administration, Washington, D. C., in reference to these tremendous figures of bacteria killed by so-called antiseptics, "These statements are loosely based on test-tube experiments and they only have to use a bigger tube, more antiseptic and more germs and the figures can be raised to any desired size."

The objections of the Council regarding the germicidal claims were transmitted to the Kolynos Company. In reply, the firm stated that the use of mercuric chlorid, Dakin's solution and other antiseptics, when applied to wounds or areas of bacterial infection, is open to the same criticism as the use of Kolynos as a germicidal agent, to which the Council objected. The referee in charge of the product did not desire to enter into a discussion of the discordant views concerning the efficacy of antiseptics, etc.; but it is readily apparent that the analogy is far fetched, for the mouth of the average healthy individual, as a rule, presents different conditions from those seen in "wounds" or areas of bacterial infection. A tooth paste, even if shown to possess germicidal properties by test-tube experiments, is in contact with the oral tissues for only a few moments at most each day, while treatment of a wound or a bacterial area with Dakin's solution (surgical solution of chlorinated soda), for example, depends, in a great measure, for its success, on a careful attention to detail, not the least of which is continued saturation of the part with the solution.

The Council cannot accept Kolynos Dental Cream for Accepted Dental Remedies, because it is a tooth paste marketed with therapeutic, chemical and bacterio-

logic claims which are not supported by adequate evidence. The Council stands ready to reconsider Kolynos when the manufacturers will agree to advertise the product in accordance with the expected functions of a dentifrice: that it is essentially a mechanical cleansing agent for the surfaces of teeth.

DR. HAND'S TEETHING LOTION—NOT ACCEPTABLE FOR A. D. R.

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Dr. Hand's Teething Lotion for Babies is one of a large line of patent medicines put out by the Hand Medicine Company of Philadelphia. In addition to Dr. Hand's Teething Lotion, the other "remedies" put out by the Hand Medicine Company are: Dr. Hand's Worm Elixir, Dr. Hand's Cough Medicine, Dr. Hand's Colic Mixture, Dr. Hand's Astringent Mixture, Dr. Hand's Compound Iron Tonic and Dr. Hand's Pleasant Physic.

The colic "cure" was the subject of a report by the Kansas Board of Health in 1913.[1] Dr. Hand's Worm Elixir was the subject of reports of the Connecticut Agricultural Experiment Station in 1924[2] and by the American Medical Association laboratory in June, 1917.[3]

Inquiries were received concerning Dr. Hand's Teething Lotion for Babies. Original specimens were therefore obtained and subjected to chemical examination in the A. D. A. Bureau of Chemistry. According to the report, which is appended, Dr. Hand's Teething Lotion is essentially a solution containing 2.5 per cent of potassium bromid in a medium of alcohol, glycerin and water. No statement of composition appears on the label or in the accompanying circulars except "Alcohol 12 per cent," obviously as required by the Food and Drugs Act of 1906.

The label states that Dr. Hand's Teething Lotion for Babies is "For bathing gums of teething babies to relieve pain and distress," and is applied thus: "Wrap clean absorbent cotton around the finger, saturate it with the Lotion and gently massage the gums. The Lotion may be applied as often as required, several times an hour if necessary."

Bromids are rapidly absorbed from the mucous membranes, and it is conceivable that continued application on the gums of babies would lead to absorption of bromid. Bromids, as is well known, act as depressants on the central nervous system, the general symptoms of bromid action being a dull headache, a feeling of lassitude and fatigue, a disinclination for physical or mental exertion and muscular weakness. Continued use of bromids is known to result in excitation, restlessness and delirium, thus defeating the purpose of its use, i.e., to obtain sleep

1. Kansas Board of Health Bull., 1913, p. 176.
2. Rep. Connecticut Agricultural Experiment Station, 1914:325.
3. Rep. American Medical Association Chemical Laboratory, June, 1917, p. 76.

and rest. Bromids have little, if any, effect on pain, except as they may render the patient less apprehensive of the actions of the central nervous system.

The object of the alcohol in the preparation is not clear; it is certainly not necessary for dissolving the bromid or glycerin. In fact, the presence of the alcohol may be more harmful, because it may be more irritating to baby tissues than is realized.

The treatment of "teething" is symptomatic, and recourse should not be made to active drugs except when absolutely indicated. This can be determined only on the basis of an individual examination by a competent physician or dentist and the proper treatment then be prescribed. If bromids or any other active drugs are indicated, the prescription should be left solely in the hands of the practitioner. Indiscriminate medication of infants, on the other hand, with bromid mixtures, and its attending effects, could not be considered in the interests of public health. The symptoms included in the indefinite expression "teething" may be due to other causes, for which reason indiscriminate medication may be actually harmful. For this and other reasons, administration of potent drugs to infants by the uninformed is not to be countenanced.

The Council declares Dr. Hand's Teething Lotion for Babies inadmissible to A.D.R. because the composition of the product is not given on the label (Rule 1); because it is advertised to the public in such a way as to encourage indiscriminate medication (Rule 3), and with unwarranted therapeutic claims (Rule 6), and because it has a therapeutically suggestive name which tends to encourage indiscriminate medication (Rule 8).

REPORT OF THE A.D.A. BUREAU OF CHEMISTRY ON DR. HAND'S TEETHING LOTION:

Twelve original packages of Dr. Hand's Teething Lotion, price 60 cents each (Hand Medicine Co., Philadelphia, Pa.), were received for examination. Each package consisted of a bottle of liquid enclosed in a carton accompanied by a circular.

> Dr. Hand's Teething Lotion. 2 fl. ozs. For Babies. Alcohol 12%. For bathing the gums of teething babies to relieve pain and distress. In many cases it will also give temporary relief from toothache both in children and adults. Hand Medicine Co., Philadelphia, Pa., Successor to D. B. Hand, M.D.

Each bottle contained approximately 50 c.c. (approximately 2 fluid ounces) of a red liquid with an alcoholic, sweet yet slightly saline taste, and an aromatic odor. A slight sediment on the bottom of the bottle was noted.

The contents of the twelve bottles were bulked for examination. The liquid possessed a specific gravity of 1.024 at 20 C. and a refractive index of 1.352 at 20 C. and a neutral reaction to litmus. Approximately 85 per cent of the sample distilled below 100 C.

Qualitative tests indicated the presence of potassium, bromid, alcohol and glycerin and a residue of plantlike material. Metals (other than potassium), halid, (other than bromid), sulphate, alkaloids, phenols, phenyl isocyanid-producing substances (e.g., chloroform, chloral hydrate) and emodin-bearing drugs were not found.

Quantitative examination yielded the following:

Total solids (100 C.)	11.68 gm. per 100 c.c.
Ash (600 C.)	2.37 gm. per 100 c.c.
Sulphated ash	1.80 gm. per 100 c.c.
Potassium (K^+)	0.77 gm. per 100 c.c.
Bromid (Br^-)	1.60 gm. per 100 c.c.
Alcohol	9.5 per cent by volume

On the basis of the foregoing, it may be calculated that a preparation with the essential properties of Dr. Hand's Teething Lotion may be prepared by mixing together:

Alcohol U.S.P.	10 c.c.
Potassium bromid U.S.P.	2.4 gm.
Glycerin U.S.P.	9.3 gm.
Water sufficient to make	100 c.c.

Such a mixture has a specific gravity of 1.024 at 20 C. and a refractive index of 1.353 at 20 C.

DR. HUBBEL'S FORMULA—NOT ACCEPTABLE FOR A. D. R.

Dr. Hubbel's Formula was considered by the Council in January of 1931. The report of the Council was sent to the Hubbel Products Corporation, but receipt was not acknowledged. In the meantime, the Food and Drug Administration of the United States Department of Agriculture issued a Notice of Judgment holding the product misbranded and the claims false and fraudulent. This action of the Government was the subject of an abstract in the Bureau of Chemistry section of THE JOURNAL for October, 1931. A letter of protest from the Hubbel Products Corporation was received. The letter contained no evidence to warrant a revision of the abstract and the firm was reminded that the report of the Council sent to them was not acknowledged. In turn the firm submitted a lengthy reply, which did not bear abstracting. The Council considered the reply and voted there was nothing in their reply to cause a revision of the Council's report below, and the Council authorized that the report be published, with the reply of the firm appended thereto.

SAMUEL M. GORDON, *Secretary.*

Dr. Hubbel's Formula was submitted to the Council by the Hubbel Products Corporation, Boston, Mass. The ingredients are stated to be: "Oleum Caryophylli, Oleum Eucalypti, Chloralum Hydratum, Oleum Menthae Piperitia, Formic Aldehyde, Acidum Asceticum, Eugenol, Thymol, Guaiacol, Camphora, Hydrastis, Alcohol . . . with the exception of two ingredients which we hold secret." The principal label states: "Chloral hydrate 8 grs. to fluid oz.; alcohol 50%." Statements of the amount of the other ingredients are not furnished. The Food and Drugs Act of 1906 requires the presence of these two constituents and amounts thereof to appear on the label.

As such, it is seen to be a "shotgun" mixture; and adequate evidence of the rationality of the mixture has not been submitted. The "formula" does not deserve to be dignified by comment.

It is sold for professional and lay use for the following conditions: pyorrhea, Vincent's infection, abscessed tooth with fistula, sensitive cavities, preparing teeth for abutments, fitting bands, local anesthesia, postextraction, sore gums over impacted third molars, treating canals, use in canals, to force gum back, erupting teeth and gum boils, taking impressions and toothache.

It is stated that "This formula—incorporating Dr. Edgar G. Hubbel's 25 years' experience as a dentist—has been prepared to fill very definite needs in overcoming oral pathology—as well as for preserving general oral hygiene." A survey of the Index of Dental Periodical Literature for 1911-1926 does not reveal the authorship of any articles in this field by a Dr. Hubbel.

The sole evidence submitted for its usefulness consists of four testimonials (presumably lay) in the advertising. It is also stated to be a "sure remedy for pyorrhea, Trench Mouth, sore and bleeding gums."

The Council declares Dr. Hubbel's Formula inadmissible to A.D.R. because it is a product of secret composition (Rule 1); tests for determining the potent or important constituents are not furnished (Rule 2); it is advertised directly to the public and through the profession for the self-medication of deep seated dental diseases, pyorrhea and Vincent's infection (Rule 4); it is marketed with unwarranted therapeutic claims (Rule 6); the name is objectionable as it does not indicate the potent ingredient of the mixture (Rule 8); and it is an unscientific mixture and hence inimical to the best interests of the profession and the public (Rule 10).

REPLY OF THE HUBBEL PRODUCTS CORPORATION

In reply to your letter of October 9th, we are submitting herewith, copies of report of tests made by Skinner & Sherman, Inc., Chemists, of Boston, as part of the scientific evidence you desire to have in connection with our claims.

We are now having a test made for the actual killing time, which we shall be pleased to submit as soon as available.

In regard to your letter of January 23rd, as mentioned in your favor of October 9th, we, at that time, did not reply as we did not feel that we could ever be accepted as a Non Official Remedy, for the following reasons:

Rule 1. We do not intend to submit the Formula of Dr. Hubbel's Formula.

Rule 4. It is not our intention to infer that the product should be used for complete self medication, as our folder suggests that the user consult their dentist. However, to obtain the best results it is essential for self medication in connection with professional treatment. Further, we regret to state we have met with several of the profession who will not prescribe, but who will use same, preferring to string their patients along, for the extra remuneration from office visits, which we do not think is in the interest of the public. Other Dentists tell us they would not use it, as they net a greater return by extracting and supplying false teeth, and as there such (sic!) unscrupulous ones among the profession the public certainly has a right to learn of something that will benefit them. This latter argument you should admit if you are acting for the good of the public, as well as from protection of the profession.

Rule 6. We do not agree, that we make unwarranted therapeutic claims; however, in the new package we are making ready, all claims are being eliminated, thereby meeting your requirements and avoiding any further conflict with the Government.

Rule 8. The Formula does not contain any potent ingredient, thereby no name can be coined to indicate it's contents.

Rule 10. We still adhere to the fact that whether or not the mixture is unscientific, it will do the work for the purposes intended.

We do not understand why it should be necessary for Dr. Hubbel or any other Doctor, to have submitted any article for publication, prior to the acceptability of any medication, to any group of persons. Therefore we cannot understand why this has any bearing on the merit of any product.

Whether or not the formula may be termed "shotgun" does not to us, seem to have any bearing on the merit of the product, so long as it does the work for which it is intended.

We are now prepared to obtain outside clinical evidence, and we believe it is order for you to state, what clinic or set of professional men you would consider of sufficient standing, for you to recognize, in addition to Dr. Hubbel's evidence of experience with the product.

It is neither our particular hope, nor desire to become a non-official accepted remedy, but it is our purpose to submit to you sufficient evidence, to lift the stigma cast upon our product, without due consideration on your part.

BUREAU OF PUBLIC RELATIONS

A PUBLIC DENTAL HEALTH PROGRAM THAT WORKS

By A. S. ROCHLIN,* D.D.S., Yonkers, N. Y.

THE following description of the several centers of dental service that comprise the public dental health program in the city of Yonkers, N. Y., is by no means exhaustive. It merely touches the "high spots" in a system which has developed gradually during the past ten or twelve years. While this system could, no doubt, be considerably improved, it possesses the unquestionable merit of having been found thoroughly practical, and productive of a high standard of dental health among the thousands of children it reaches yearly.

As at present constituted, the public dental health service in Yonkers consists of the following three divisions:

1. Service rendered by the dental hygienists in the schools.

2. Work done at the city dental clinic under the supervision of the Yonkers Department of Public Health.

Tel: Nepperhan 6179

DEPARTMENT OF PUBLIC HEALTH
YONKERS, NEW YORK

TO DENTAL CLINIC: ROOM 205, PHILIPSBURGH BLDG.

Please admit for dental care, for which I am unable to pay

Address .....

Parent's signature .....

I have investigated this case and find that the family cannot afford to pay a private dentist or the dental pay clinic.

(Signed) .....

..... Agency

(over)

Fig. 1.—Admission card.

PENALTY FOR FALSE REPRESENTATIONS
Section 296, Chapter 55, Consolidated Laws

"Any person who obtains medical or surgical treatment on false representations from any dispensary licensed under the provisions of this act, shall be guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not less than ten dollars and not more than two hundred and fifty dollars."

(Imprisonment until fine be paid may be imposed. Code Crim. Pro., Section 718.)

Fig. 2.—Admission card (reverse side).

Room 205
Philipsburgh Building.
2 Hudson Street

Telephone
Nepperhan 6179

Department of Public Health
Yonkers, New York
DENTAL CLINIC

Name .....

Kindly present this card at each appointment.

c-22

Fig. 3.—Appointment card. On the reverse side, ten blank lines are provided for appointment dates.

3. Work of the dental clinics in the hospitals and orphanages.

1. *Service in the Schools.*—The department of education employs five dental hygienists, supervised by a local dentist. The hygienists visit the schools at definite periods and examine and give prophylactic treatments to the children in grades one, three and five. Notices are sent to the parents of all children examined whose teeth are found to be defec-

*Chairman, Dental Advisory Committee, Department of Public Health.

tive. These notices, of course, urge that the child be taken to the family dentist or, in the cases of the very poor, that the child be sent to one of the dental clinics. The hygienists also instruct the children in correct tooth brushing and conduct several dental projects during the year. These projects take the form of health playlets, poster work, health essay contests, etc. The report of this service for the school year 1930-1931 appears in Tables 1-2. Work similar to that done by the dental hygienists in the public schools is carried on also by the hygienist engaged in the parochial schools, the latter being under the supervision of the department of health.

TABLE 1.—REPORT OF DENTAL CONDITIONS IN PUBLIC SCHOOLS (1930-1931)

School or Group	Perfect Cases	Completed Cases	No. of Defects per Child Unit	No. of Corrections per Child Unit	Defects Corrected	Children Having Dental Corrections	Children Having No Corrections	Corrections by Extraction of Permanent Teeth	Corrections	
									Extractions	Fillings
	%	%			%	%	%	%	%	%
1	1.5	0.8	3.8	0.2	5.8	24.6	75.4	10.7	46.4	53.6
2	7.3	3.7	5.1	0.4	8.8	22.1	77.9	1.2	73.7	26.3
3	16.8	3.1	2.4	1.1	44.7	37.0	63.0	10.0	39.3	60.7
4	25.2	6.7	2.7	0.3	9.6	17.4	82.6	8.6	53.3	46.7
5	20.8	4.8	3.9	0.2	5.8	17.9	83.1	0.2	53.2	46.8
6	25.6	26.4	2.6	1.0	39.8	62.8	37.2	8.3	54.8	45.2
7	8.6	10.9	4.4	0.7	16.7	34.4	65.6	11.4	61.5	38.5
8	34.8	19.1	2.8	0.5	18.7	32.6	67.4	0.0	7.8	92.2
9	10.6	17.3	4.5	1.1	24.2	31.7	68.3	8.6	45.7	54.3
10	9.7	32.6	3.8	1.5	38.3	62.9	37.1	11.0	61.9	38.1
11	26.4	9.6	3.4	0.5	14.8	30.5	69.5	5.4	34.8	65.2
12	3.6	1.8	5.1	0.3	7.7	22.4	77.6	11.4	70.1	29.9
13	38.3	44.4	3.2	1.4	43.1	77.7	22.3	2.3	32.2	67.8
14	29.7	30.9	2.7	1.2	46.5	65.5	34.5	6.2	50.0	50.0
15	30.3	.....	3.1	.....	.....	.....	.....	.....	.....	.....
16	42.0	28.2	2.9	0.7	22.6	49.5	50.5	5.6	33.1	66.9
17	18.2	3.3	4.6	0.3	8.1	27.7	72.3	11.4	70.2	29.8
18	10.7	2.9	3.7	0.2	6.1	17.4	82.6	19.0	72.3	27.7
19	8.9	15.8	5.5	0.9	17.1	37.6	62.4	12.2	62.6	37.4
20	5.3	11.9	5.1	0.8	15.8	47.8	52.2	17.8	76.6	23.4
21	27.4	50.0	3.5	1.3	38.1	69.8	30.2	4.0	31.8	68.2
22	19.1	32.2	3.8	1.8	47.4	68.8	31.2	11.2	63.1	36.9
23	7.1	8.2	4.3	0.9	20.8	40.4	59.6	16.9	56.5	43.4
24	11.4	1.6	5.7	0.1	1.9	28.1	71.9	5.0	45.0	55.0
25	37.8	24.3	2.1	0.8	35.8	39.1	60.9	.....	41.0	59.0
Composite of twenty-five schools	17.4	16.1	3.9	0.7	19.1	36.2	63.8	9.4	51.3	48.7

2. *The City Free Dental Clinic.*—This was established in April, 1930, through the efforts of several local den-

tists and social agencies, as well as of the health commissioner, Clarence W. Buckmaster, who induced the city administration to establish a free dental clinic for the children of the poorer classes in the community. The sum of $5,000 was appropriated by the common council for that purpose for the current year.

The clinic is operating under the department of public health. The health commissioner appointed an advisory committee of five local dentists whose duty it has been to organize and supervise the project. The members of this committee were selected as representing the local dental societies.

TABLE 2.—DENTAL HEALTH PROGRAM DATA

Number of children in program,		5,908
Number of toothbrush drills,		900
Number of lectures to groups,		1,597
Clinic cases,		1,090
Private dentists' cases,		676
Perfect cases,		1,031
Completed cases,*		956
Total number of defects,		23,172
Number of fillings	Permanent,	1,416
	Temporary,	748
Number of extractions	Permanent,	418
	Temporary,	1,855
Total number of corrections recorded in school year,		4,437

*Many cases are corrected after close of year.

The dental work in the clinic is done by two dentists employed by the city, each working one-half of every week day, a full-time clinic resulting, which treats on an average of twenty children daily. The salary of each dentist is $1,800 a year.

A dental assistant helps the dentists at the chair and has complete charge of the routine of the clinic. The assistant's salary is $1,200 a year.

The facilities of this clinic are open to children up to and including 16 years of age who have been recommended by one of the approved social agencies in the community as being entitled, by virtue of economic circumstances, to free dental service.

Each child, on coming to the clinic, brings an admission card, signed by the parent and by the social worker representing the organization sending the child. (Fig. 1.)

A detailed report of the work of the Clinic is submitted to the health commissioner every month. Monthly reports are also sent to the various social agencies, showing the disposition of the cases referred by them to the clinic.

TABLE 3.—FIRST ANNUAL REPORT OF WORK OF THE CITY DENTAL CLINIC, DEPARTMENT OF PUBLIC HEALTH, YONKERS, N. Y.

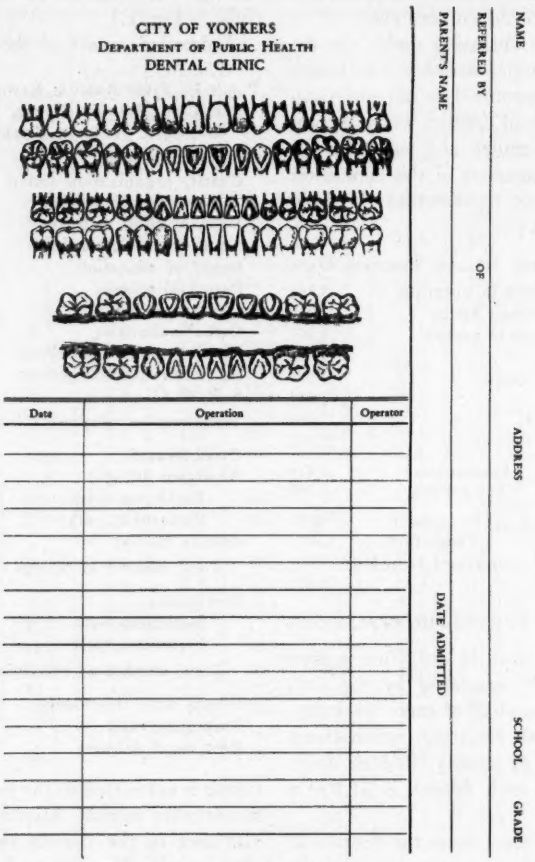
Children admitted:	
Charity organization society	239
Tuberculosis dispensary	349
Dept. of child welfare	178
Dept. of public charities	157
Board of education	81
Parochial schools	128
Dept. of health	16
Catholic charities	45
Visiting nurses' association	5
St. John's Hospital service	4
S. P. C. C.	1
Total number admitted	1,203
Cases treated	1,043
Amalgam fillings:	
Deciduous teeth	568
Permanent teeth	2,583
Silicate fillings	221
Total number of fillings	3,472
Extractions:	
Deciduous teeth	1,796
Permanent teeth	743
Total number of extractions	2,539
Prophylactic treatments	295
Roentgenograms	18
Root canal fillings	4

(The type and number of operations performed at the clinic, and the organizations through which the children are sent, are shown in Table 3.)

During the past year, in addition to

the work done at the clinic, considerable "lay" educational work has been accomplished under the sponsorship of the public health department. A number of articles on dental health have been published in the local press and in the Association, as well as with the local dental societies in their educational programs.

While the clinic is at present located in temporary quarters, operating with one chair, plans have been completed for


CITY OF YONKERS
DEPARTMENT OF PUBLIC HEALTH
DENTAL CLINIC

NAME
REFERRED BY
PARENT'S NAME
OF
ADDRESS
DATE ADMITTED
SCHOOL
GRADE

Date	Operation	Operator

Fig. 4.—Patient's chart.

monthly bulletin of the Yonkers Tuberculosis and Health Association. The Committee has also cooperated in the radio health broadcasting campaign of the Yonkers Tuberculosis and Health

a new and more elaborate lay-out, the clinic to be located in the Yonkers Health Center, now under construction. The present plans call for three complete operating units to be installed in the clinic

in the new building, with arrangements for a staff of probably four dentists, a dental hygienist and an assistant.

It is the purpose of the department of public health to put into complete effect as soon as possible the following program:

(*d*) Orthodontia.

2. Instruction by dental hygienist:
   (*a*) Tooth brushing (possibly supplying toothbrushes and dentifrice at cost).
   (*b*) Diet.

HISTORY

Age ..... Weight ..... Height ..... Color .....

Health ..... Good ..... Fair ..... Bad .....

Breathing ..... Normal ..... Mouth .....

CONDITION OF TEETH

Occlusion ..... Good ..... Fair ..... Bad .....

Deposits ..... Stains ..... Erosion .....

CONDITION OF GUMS

Gingivitis .....

CARE OF TEETH

Brushing .....

Visits to Dentists .....

REFERRED TO

Physician .....

Nose and Throat .....

Orthodontist .....

Xray .....

Diet .....

Fig. 5.—Patient's chart (reverse side).

A. Through the work at the clinic:
   1. Corrective measures (ages 2-16):
      (*a*) Prophylaxis.
      (*b*) Fillings.
      (*c*) Extractions.
      (*c*) Prenatal care.

B. Public education:
   1. Series of press articles.
   2. May Day program and exhibit.
   3. Radio talks.

4. Talks to organizations and the schools.
5. Distribution of dental educational literature.
6. Dental movies.
7. Cooperation with the schools and other institutions in the furtherance of their dental health programs.

3. *The Dental Clinics in the Hospitals and Orphanages.—A.* The clinic located in St. John's Hospital, a part-pay clinic, is supervised by the Yonkers Tuberculosis and Health Association. Children of parents who can afford to pay a nominal fee for dental services are taken to this clinic by one of the school nurses. The charge made is on the basis of $2.40 an hour. This fee, it has been found, makes the clinic practically self-supporting. The clinic engages one dentist for one half of every school day.

B. St. Joseph's Hospital, which maintains a part-time clinic for extractions only, extends its services to children and adults. The fee charged is 50 cents.

C. The several orphanages situated in Yonkers maintain dental clinics of their own. With one exception, they each employ a dentist on part-time basis. The exception is the Hebrew National Orphan Home. This institution has a voluntary dental staff of local dentists who have been doing particularly fine work at the Home during the past nine years, maintaining an average of as high as 50 per cent of perfect cases among the children.

In addition to the work outlined above, a service exists in connection with the work of the Charity Organization Society of Yonkers, which should also be mentioned. Twenty local dentists have pledged themselves to take care, without charge, of the emergency cases sent to them by the Charity Organization Society. This service supplements the work of the other services, and it is felt that it fills a vital need in the community.

Altogether, the program described in this article has met with the hearty approval of the local school and health authorities, and is regarded highly by the dental profession of the community and by the public generally.

In connection with the report given in Table 2, Walter E. Fancher, in charge of the work of the hygienists in the public schools, states: "May I add that I always lay particular stress on the educational feature of the work. Fully half of each hygienist's time is spent in instructing the children individually and in groups in the fundamental knowledge and care of their dental equipment. As proof of the value of education, may I call attention to the increased percentage in perfect cases over a ten-year period. It will be noted that it was 17.4 per cent this year as compared with 8.1 per cent ten years ago."

A CHALK TALK ON PREVENTIVE DENTISTRY AND ORAL HYGIENE FOR SCHOOL CHILDREN

By H. A. BOYSEN, D.D.S., Waterloo, Iowa

IT HAS been my pleasure to use this talk in conjunction with illustrations before audiences of children ranging in age from the kindergarten through the eighth grade. The fact that they can see the point illustrated never fails to hold their attention, and provides the opportunity to drive home the lesson in such a way they will not soon forget it. What child is there that doesn't like to hear a story told or see a picture drawn? Scientists tell us that nothing which completely occupies the mind for any length of time is ever forgotten. This, then, is the reason that the chalk talk method of teaching is so everlastingly impressive.

It is suggested that paper and chalk be used. Ordinary blank newspaper and color crayons are the best, but plain wrapping paper and charcoal, which are usually available, will do just as well. Some prefer to use a blackboard, and as this is handy in every school, it can be employed to good advantage. The drawings here illustrated are simple and thus, with a little practice, can be mastered by the least skilful. No apology need be made for the appearance of your drawing or for your ability as an artist. Your young audience will be "right with you" if you are earnest in your presentation.

We should remember that, in a talk to children, we must employ terms that they can understand and apply. Therefore we use the fairy story and make a very common, everyday application throughout. Tell the children you are going to tell them a story, a fairy tale, if you please, but no ordinary fairy tale. Tell them they must listen most carefully because, after the story has been told, you are going to expect them to tell you what the story is really about.

THE STORY*

Unlike most fairy tales, this one does not begin "Once upon a time, long, long ago," but: "There live, at this present time, a family of Brownies"; and continues:

Did you ever hear of the D. Kay Brownies? They are in mischief from morning till night, and they like to destroy things, no matter how valuable or how beautiful they may be.

Once the D. Kays spied a whole row of white houses upon the crest of a hill. They stood close together in a graceful curve and were smooth and pearly white. (Draw outlines of teeth as in Figure 1.)

The Brownies were very curious about these beautiful marble houses, and as they seemed to be deserted, they decided to break into them. Fearful that they would be discovered by the police, of whom they are much afraid, the little fellows crawled between two of the largest houses so that they could not easily be seen and began to dig into the pretty marble with little picks. (Draw Brownies.)

With shouts of glee, they decided to dig a cave for themselves and live like a real robber band. They picked away busily and soon a big cave was made. Whenever they wanted more room they dug more caves in the houses. (Show cavities.) As the openings

*The author does not claim to be the originator of this story. It was obtained from some publication of several years ago, the name of which cannot here be recalled.

in the caves were small, no one noticed them, and the Brownies lived undisturbed for a long time.

They were in high glee when they found cake, cookies and candy of different kinds between the houses. They liked candy, and it made them strong and fat.

A number of months had passed when a visitor came. He belonged to a titled family and on his little visiting card was printed "Don Tolgia." The very day that the visitor came, some of the Brownies who were playing around the large room in the first cave they had dug discovered a hole in the floor. Imagine their surprise when they peeped in and saw a giant asleep in the cellar. The little Brownies were afraid, but the Don, who was very cruel, said he was not afraid for he carried a sword by his side. He went

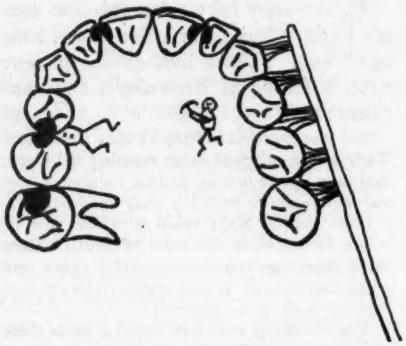


Fig. 1.—Outline used to illustrate the opening of the story. First, the teeth are sketched; next the brownies; then the carious areas, and, finally, the toothbrush. This is a deciduous set of teeth, including the first permanent molars.

to the hole and thrust his sword into the giant's side and wounded him so that he moaned aloud. In fact, such a disturbance was made that at last the owner, who had been very neglectful of his property, came to investigate. To add to the confusion, the roof of the house fell in with a crash. The groans of the giant made the poor landlord's head ache, and he felt so miserable that he sat down and cried.

As it is with most things, just crying did no good at all, so he dried his tears and sent for a mason to repair the houses. The mason looked the houses over carefully and seemed quite sad because he found it was too late to repair the house that was so badly broken down. He told the owner to peep into the cellar and showed him that the giant had already died from the sword thrusts of the cruel Don. The mason felt sorry about the death of the giant and explained that he had not been asleep at all, but was a most faithful workman by the name of "Pulp." He also explained that these giants were very sensitive and easily killed, which was a pity, as they were skilled workmen. He said that these houses were very different from ordinary buildings because their foundations (roots) are built last instead of first, and it required four years to complete each foundation. (Draw roots on first permanent molar.) It was a serious thing, he said, for a giant to be killed or even wounded before he had completed his task, because, even if the house still stood, the foundation would be incomplete

Fig. 2.—Outline of permanent molar.

and weak; and furthermore, each giant was given his task and no one else could take his place.

Nothing could be done to the house that had been so badly damaged but to remove it, foundation and all; which left an ugly gap in the even rows of houses. Since they could find no more marble like that of which the houses were built, the mason said that he would have to use other materials, maybe gold or silver.

It was now decided that the houses would have to be repaired at all costs, so the mason was told to go to work. He was much surprised to learn that a watchman had never been employed to guard this valuable property to keep the mischievous Brownies from doing serious damage. The owner, now awake to this great danger, sent for a policeman (toothbrush) and terror reigned among the Brownies. They knew the policeman because

he had been after them for years. He went around and poked in every nook and corner and he shot powder at the Brownies and killed and wounded many.

After the mason had repaired the houses, and polished the marble, they looked smooth and white; but, of course, they were not like new. The mason told the owner to send for him every few months and he would look over his work and see that the patches were still good and strong. The policeman with the stubby beard was regularly employed by the owner, and each morning and night he patrolled his beat and poked into every corner. Soon not a Brownie was to be found and the owner lived most happily ever after.

Now, what have we been talking about? (Pause.) Teeth, of course, and the Brownies? Germs. The caves dug? Cavities in the teeth. Who is the cruel Don Tolgia? This is not so easy, for

Fig. 3.—Tooth drawn to show effect of the presence of fermented food residue: a break in the enamel and grief to the owner.

he is really toothache, for which "odontolgia" is but another name. Who is the giant? He is commonly called the nerve, but is more properly called the pulp. Who is the policeman? The toothbrush, with his stubby beard. (Draw a toothbrush.) Who is the mason that was hired to repair the houses? He is none other than your good friend the dentist.

Now I am going to ask another question. How many of you washed your faces this morning before coming to school? (Pause.) Well, that is good. All of you washed your faces. How many of you cleaned your teeth this morning before coming to school? Now, I believe if you are going to omit one washing or the other, you had better clean your teeth and let your face go dirty. But I would not omit washing either of them if I were you because, if you do not wash your face, it will look so bad, and if you do not wash your teeth, it will be bad for you in a number of ways.

Now, for another question. How many of you ever had the toothache? (Pause.) Most of you have had the toothache. I am going to tell you what causes the toothache and how you can keep from having it. We will draw an outline of a tooth, a permanent molar.

Fig. 4.—Tooth repaired, bringing relief to its owner.

(Fig. 2.) This tooth makes its appearance in the mouth at 6 years of age and is the first of the permanent molars or grinders. Now you know that teeth cannot ache unless they decay, and I want to tell you what makes them decay. But first I wish to ask you another question. Let us suppose the evening meal is over. Everyone has left the table and mother is clearing off the dishes. Here are some meat, butter and cheese that were left over. Mother wants to keep them until tomorrow. Where does she put them? She puts them into the ice box. That is right. But why does she put them into the ice box? Why not put them on the

back steps where the sun and rain could get to them? They would spoil or decay. That is right. That is just what happens to the food that remains around and about the teeth.

The mouth is warm and moist, and the food that remains on the teeth after a while rots or ferments and forms acid that eats into the tooth. We will suppose that this is some food on the top of a tooth (Fig. 3), and a cavity has started, the enamel breaks in, the tooth begins to ache, and we are likely to get a look on our face like this. (Fig. 3.) If we are wise, we will have the cavity filled before the tooth begins to ache and then we can wear a look like this. (Fig. 4.) (Figures 2 and 3 need not be drawn

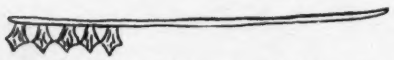


Fig. 5.—Toothbrush recommended to pupils.

in their entirety, but Figure 3 is readily made by adding to Figure 2 the points that are indicated on Figure 3. It is better to make Figure 4 an entirely separate figure.)

When the week's washing is ready to be put away, Mother picks up your stocking and runs her hand down inside to the toe. Sometimes, she finds a little hole there. And what does she do? She mends it. That is right. Now, if Mother misses that little hole and you put on those stockings again and wear them, that little hole becomes a big one, and the next time Mother sees it she says: "My! I wish I had found that and mended it while it was little because it has been getting bigger and bigger and now it will take much more time to mend it." That is just the way it is with these holes that the acid makes in your teeth. They just keep on getting bigger and bigger. It is much easier and better to mend them when they are little holes than to wait until they become big ones.

We spoke about the toothbrush a while ago. What kind of toothbrush is the best? I will make a drawing of the best kind of a brush to use. (Fig. 5.)

DEMONSTRATING THE USE OF THE BRUSH

The brush, which is of more importance than all else in cleaning the mouth, should be carefully selected. Most brushes are too large to permit a sufficiently free movement in the mouth. A brush about the size of those sold as child's or youth's brushes is to be preferred. The bristles should not be too closely set: there should be nearly as much space between the rows of bristles as is occupied by the bristles. Select a brush as stiff as can be used without causing pain. After using the brush, you should rinse it thoroughly with water and hang it up to dry. Follow a definite, systematic plan of brushing. Form the habit of beginning at a certain place and go on around. (I have found it very effective to have a boy or girl step forward and take a seat before the other scholars. Then, I can demonstrate the use of the toothbrush in such a way that they will understand and remember. They feel well repaid for helping me if I make them a present of the brush.)

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Pyogenic Infection of the Parotid Gland: A review of cases found in the local hospitals and in the literature is made by Daniel W. Layman (*J. Indiana State M. A.*, Sept. 15, 1931). Formerly, it was thought that most of the infections of the salivary glands were of a metastatic origin, but now it is believed by many that infections are carried to the salivary glands by the excretory ducts. Possible complications are: retropharyngeal abscess, external auditory canal abscess, temporal fossa abscess, cervical abscess, phlebitis, septicemia, facial paralysis and neuralgia of the temple. Dr. Shields, attending dentist at the Long Hospital, Indianapolis, reported a case of suppurative parotitis complicated with meningitis, in a man, aged 21, the condition arising three weeks after extraction of a lower right molar. Death ensued. Of eleven cases in the Long Hospital records, two followed removal of impacted molars. One of the cases, referred to as of accidental origin, resulted from the yen of a medical student to make some scientific investigations on his own responsibility. A shaving brush bristle which he inserted in the opening of a salivary duct in his left cheek was not recovered until he had spent two weeks in hospital, with swollen and painful face and jaw, temperature ranging to 103 and a blood count of 30,000. Five of the eleven cases proved fatal. In the records of another hospital, of fourteen cases, one fatal, recorded, two followed extraction of teeth. A third hospital showed twenty-one cases, with five fatalities. Of all recorded cases, those in which incision and drainage was performed ran a milder course. Blair and Padgett report thirty-five cases, fifteen postoperative, two of which followed extraction of teeth. Early operation is recommended. Early symptoms in postoperative cases are pain and stiffness in the lower jaw articulation, dryness of the mouth, swelling of the tongue, which is of a brownish cast, and a decrease in salivary secretion. A swollen mass in front of the ear should prompt the physician to note at once whether pus exudes from the salivary duct. Irradiation by radium has been recently advocated for parotitis. The author suggests, as has been advanced by Bachrach, that if the infection is an oral or ascending one, as some writers believe, the fact that the patient must abstain from eating may alter the secreting glandular apparatus of the mouth and render the parotid gland more susceptible to infection. As a preventive measure, prophylactic oral asepsis before and after operation is advocated by Collins. Blair recommends the use of lemon drinks, chewing gum and gentle probing of the ducts. Josephson advances the theory that since cases have arisen after gynecologic operations, there is a relationship between the salivary and the genital glands, and sudden removal of the functioning ovarian tissues may upset the balance in internal secretion, inhibiting secretion of the salivary glands and rendering them less resistant to infection.

Significance of Deciduous Teeth for Development of Permanent Teeth: Scheidt (*Arch. f. Kinderheilk.*) deplores that many parents give less attention and care to the teeth of the first dentition than to those of the second dentition in the belief that only the latter are really important. However, besides the great significance that properly functioning deciduous teeth have for the growing organism, they are also important for the development of the permanent teeth. Their presence until after the complete resorption of the roots is essential for the development of the outer form of the future jaw apparatus. By this stimulation, the growth tendency is increased. The promotion of the growth of the jaws has of course also a favorable influence on the space development for the teeth of the second dentition. Moreover, by the pressure transmission, the deciduous teeth exert a trophic stimulation on the tooth pulp of the underlying permanent teeth and the pressure produced by chewing with the deciduous teeth meets the opposing expansion pressure of the growing

tooth pulp, enhances this expansion pressure and thus promotes the resorption of the tissues covering the growing tooth and of the root of the deciduous tooth. The author further discusses the rôle of the various groups of the deciduous teeth as place preservers. The deciduous incisor teeth are not significant as place preservers but are important in securing the proper mesiodistal position relation between the upper and the lower jaw. The place preserving function of the deciduous molar teeth is considered by the author in regard to the three dimensions. The transversal place preservation of the deciduous molars is of minor significance. Of greater importance is the preservation of the proper height of the teeth, but of primary significance is the place preservation in the sagittal direction; that is, in regard to the length of the jaws. The author further discusses the anomalies that may develop in case of premature loss of the different deciduous teeth, and he directs especial attention to the development of the first permanent molars, which a layman sometimes mistakes for deciduous teeth and consequently not in need of special care. In the conclusion, he stresses that the cooperation of the pediatrician is essential in the care for the deciduous teeth.—Abstr. *J. A. M. A.*

Factors Concerned in Radiation Therapy of Malignant Disease: The question "Of what value is radiation therapy in the control of malignant disease?" can no more be answered by a simple statement than can the query, "Of what value is surgery in the control of malignancy?" (L. R. Sante, in *Illinois M. J.*, July, 1931). Factors in the successful irradiation of malignant lesions are: 1. Location and size of the growth. 2. The degree of radiosusceptibility of the actual cells composing the tumor. (Embryonal tumors succumb readily to the effect of radiation, whereas the highly differentiated nerve tissue tumors are least of all affected.) 3. Cell nutrition. Tumors may be destroyed by the action of radiation on their blood vessels, interfering with their nutrition. The environment of the tumor cells may also influence their susceptibility to irradiation, probably largely through an effect on their nutrition. For instance, squamous cell carcinoma located on the lip, where it depends entirely on its blood supply for nutrition, may be very readily destroyed by irradiation, whereas, cells derived from the same growth which metastasize to the cervical lymph nodes, where the cells lie in the lymph spaces and derive their nutrition from the lymph, may be peculiarly resistant. Carcinoma of the tongue depends for its nutrition on its immediate blood supply and in many instances even squamous cell carcinoma in this location responds readily to irradiation. Three more or less distinct types of reaction of tumor tissue to irradiation are recognized: 1. Autolytic. 2. Necrotic. 3. Growth-restraining. The first takes place in embryonal tumors or the highly cellular, rapidly growing, vascular tumors which are nourished by newly formed blood vessels. These tumors melt away in an incredibly short time. The necrotic type of reaction results when highly differentiated resistant tumors are treated with radiation in sufficient doses to cause their destruction. There are, of course, many tumors with sensitivity between these two extremes which require varying degrees of irradiation for destruction of their cells. The growth-restraining reaction is characterized by the production of large amounts of fibrous tissue about the individual cells of the entire tumor, choking off the tumor and restraining its growth. The multitude of factors concerned in the determination of the degree of radiosensitivity of any growth renders its ultimate reaction to radiation uncertain even in the face of complete clinical and microscopic analysis. Microscopic examination is often of great advantage in estimating radiosensitivity, and where this is not available, access can still be had to the results of previous observations on the radiosensitivity of growths which predominate in any given location. The complex character of malignant growths renders it impossible to determine definitely the outcome in any given case following irradiation. The small growth should never be considered too insignificant for the irradiation "test" treatment, nor the extensive growth too hopeless. Under the test treatment, i.e., the application of a single intensive course within the tolerance dose of irradiation, the tumor is observed for three or four weeks for signs of regression.

Dental Dystrophies and Their Diagnostic Value in Diseases of Children: From his experience in the Paris hospitals, Thibault (*Paris med.*) believes that every toxic infection leaves its mark on the teeth. Complete dystrophies alter the form and dimensions, while partial dystrophies cause erosions. These are classified as capsular depressions, linear erosions, semilunar notching and irregular edging. The capuliform depressions

are seen following bronchopneumonia, gastro-enteritis and eruptive fevers. Linear erosions follow chronic intestinal conditions and poor alimentary hygiene. Notching and edging are found following tetanus and rickets. Hutchinson's teeth represent the result of a complete dystrophy and are characteristic of syphilis. In twenty-two of twenty-three cases of this condition, the Wassermann reaction was positive.—Abstr. *Am. J. Dis. Child.*

Importance of Sugar in the Diet of the School Child: The predilection, amounting to a craving, on the part of most children for sweets, suggests, according to A. Arnold Osman (*Dent. Surgeon,* Aug. 22, 1931), some underlying physiologic need. For many years, it has been common to regard the use of sugar, especially in the form of sweets, as harmful to children, particularly with regard to the development and health of the teeth. If the child's natural desire for sweet foods has a physiologic basis, it can probably be thwarted only at considerable risk to the general health. It is believed within reason that many minor illnesses among children of school age may be due to an insufficiency of sugar in the diet, especially in the presence of an excess of fatty foods. It is asked whether the dental profession considers that sufficient evidence has been offered that sugar is injurious to the teeth to justify its present general condemnation as an accessory foodstuff for children. The great expenditure of muscular energy on the part of the child calls for the food substance that has been proved to be the primary fuel of muscle. The starches replenish the body needs in this respect at leisure, but the child needs a rapidly utilizable fuel such as sugar. The major symptoms of sugar deprivation are those associated with "bilious attacks, cyclic vomiting, headache, pyrexia, anorexia and muscular prostration, and constipation or diarrhea. A study of the exciting factors in an attack will show that there are three common causes: (1) mental fatigue and excitement, (2) infection and (3) physical exhaustion, all conditions that make a demand on the sugar reserves of the body. The minor symptoms of sugar deprivation may be summed up in the word "fatigue." The child is pale, languid, depressed and has dark circles under the eyes. Many of them come to the outpatient department of children's hospitals because of pallor, anemia, headache, flabbiness, fainting attacks, abdominal pains, constipation, growing pains or asthma. The drinking of extra milk at school, tonsillectomy, appendectomy and sun baths have not helped the situation. In the majority of cases, these conditions clear up when the allowance of sugar in the diet is increased. The author states: "With the exception of diabetes and possibly same cases of diarrhea, I know of no disorder to which children of school age are liable which is made worse by the addition of extra sugar to the diet, nor have I ever seen any ill-effects follow such a course. On the contrary, I submit that there can be no reasonable doubt that there is an enormous amount of chronic misery and ill-health—and incidentally money wasted on education—which could be prevented if the giving of adequate amounts of sugar to children were not taboo, and if we were more ready to learn from the child than to teach him." It is not his belief that sugar will aid in remedying all the ills of childhood, but that the diet must be one that is correctly balanced and not designed to overcome some particular danger, fancied or real. As a result of the stressing of fatty foods, because of their vitamin A and D content, a large proportion of children of school age are suffering from a relative sugar deficiency. The author concludes "It is of the utmost importance, therefore, that the dental profession should be acquainted with the situation, and should consider whether the evidence that they have offered against the use of sugar from the dental point of view is such as to still justify its condemnation, and, if this is so, whether this essential foodstuff cannot be supplied in sufficient amounts in a form which will not cause damage to the teeth."

Chemical Composition of Deciduous Teeth: In a recent issue of *La Stomatologia,* Dr. G. Bergamini records the results of investigations carried out by him with a view to determining and comparing the calcium oxide content of the crowns of healthy and carious deciduous teeth. Forty sound and carious deciduous dentitions were investigated by the following method. Freshly extracted teeth were first carefully washed and the roots and remains of the pulps removed. The crowns were then dried and reduced to ashes in platinum crucibles, the calcium oxide content being then estimated. It was found that the percentage of calcium oxide was quite definitely higher in the healthy than in the carious teeth examined; the percentage in healthy varying from 37 to 41, whilst in carious teeth it varied from

31 to 36. The author regards these results as evidence that caries in the deciduous teeth depends primarily upon partial decalcification due to digestive disturbances. It is at least open to question whether these conclusions are justified by the evidence put forward. —*Dent. Surgeon.*

Angina Agranulocytica and Its Treatment: Hamburger (*Johns Hopkins Hosp. Bull.*) believes that agranulocytic angina should be treated as a life-threatening emergency by immediate and repeated blood transfusions, the cautious irradiation of the skeleton by an expert roentgen therapeutist and the vigorous treatment of local lesions. The phlegmonous cervical mass, when present, has sometimes been incised to relieve respiratory obstruction, but as a rule it seems wise to abstain from surgical intervention, since a localized abscess does not form under the agranulocytic state.—Abstr. *J. A. M. A.*

Roentgen Therapy of Angina Agranulocytica: According to Waters and Firor (*Johns Hopkins Hosp. Bull.*), the results of roentgen irradiation of the bone marrow in angina agranulocytica, though not definitely ascertainable as yet, justify a trial of such therapy whenever possible.—Abstr. *J. A. M. A.*

Episcleritis: A case of episcleritis affecting both eyes and apparently due to focal dental sepsis was shown by Mr. A. F. MacCallan before the Royal Society of Medicine. The patient, a man of 31, gave a history of episcleritis of the left eye of twelve years' duration, but the disease had only been noticed in the right eye for two or three days. On examination, severe dental sepsis affecting five teeth was discovered; and as soon as these five teeth were extracted, the right eye rapidly cleared up. The tonsils were also found to be septic, and pus was found in the left antrum and in the ethmoidal cells. It is hoped that when these remaining foci of infection have been adequately dealt with, the condition of the left eye may also be much improved.—*Dent. Surgeon.*

State Medicine: Whenever a large proportion of people are affected adversely there is bound to be a reaction, and an amelioration will be demanded. We know from political economy and sociology that the mass invariably rules. If there is something wrong with the manner in which the wealth of our nation is being cared for, the medical profession should be the first to recognize and first to rectify the condition. If every physician would apply in his practice all that which he knows about public health, preventive medicine and curative medicine, there would be less dissatisfaction with the medical service in the minds of the public. The liaison between the public health service and the medical profession should be the health officer of the community. It is exceedingly important that the health officer be a *representative* medical man chosen by the county medical society, and that no politics be displayed. The state medical society should have at all times a more than vigilant committee whose function it will be to become cognizant of all impending legislation, and to ascertain whether or not it will affect the medical profession, advantageously or otherwise, before it has become crystallized into a bill. We are to remember that that which is derogatory to the medical profession is harmful to society. Also, that no system of practice can be successful which disregards the close personal relation between physician and patient.—R. H. Beeson, in *J. Indiana State M. A.*

MISCELLANY

BOOK REVIEWS

Tissue Changes Under Excessive Occlusal Stress. By B. Gottlieb and B. Orban, Vienna. 225 pages; 227 illustrations. Published by George Thieme, Leipzig, 1931.

In this book, the authors report their findings in an extensive investigation which was undertaken for the purpose of showing what part traumatic occlusion plays in the development of periodontal diseases. A great deal of credit is due these investigators for choosing so timely a subject, as there is probably no other subject in dentistry regarding which there have been so many unconsidered and superfluous statements, both spoken and written, as this one, during the past ten years.

This epoch-making study was undertaken in 1925 and is carried up to date. The principal source of material was very aptly chosen from fifty dogs, in which various types and degrees of traumatic occlusion were produced. The time of the experimental trauma varied between twelve hours and thirteen months. In order to forestall criticism, all questionable cases, i. e., in which errors might have developed, were rejected. Thirty-three dogs were finally used, and, in addition to this material, the jaws of five monkeys and four human beings were also used for comparative study. Most of the experimental stress was brought about by the use of different types of gold crowns on opposing teeth. These were allowed to remain in place for varying periods of time, after which the material was prepared for study. In a number of cases, the crowns were removed and the animals allowed to live for some time in order that a study of the reparative processes might be made.

The chief factors incorporated in this research were: the behavior of cementum and bone under different degrees of traumatic force, the influence of horizontal and vertical pressure as well as pull on these various tissues, the age question with reference to reactions produced, the effects brought about by variation of the time and intensity factor in trauma, and, finally, the behavior of the all-important epithelial attachment in these experimental traumatic cases.

Since it is impossible to discuss all of the findings in this necessarily limited review, only the more important of these will be cited. Under pressure, beginning bone resorption could be observed within twenty-four hours. This was not confined to the alveolar walls, but extended into the marrow spaces quite remote from these regions. On the alveolar walls where pull was exerted, apposition of new bone took place. The rapidity of resorption and apposition was directly dependent on the amount of force used. The authors' theory that similar forces acting on bone and cementum do not produce similar results was amply verified. Particularly noteworthy was the observation that, in some instances, cementum deposition took place in the pressure areas when, simultaneously, bone resorption was going on. In general, cementum resorption rarely accompanied bone resorption, and then only when excessive pressure was applied and rapid movement undertaken. It was more commonly noted in the old than in the young.

Very limited detrimental effect was produced on the soft tissues. Age was found to be quite an important factor, reactions in the young being more rapid and less destructive. Pocket formation and epithelial proliferation could not be brought about by either pressure or pull, and concerning the most important question, the one which formed the basis for this study, the authors very emphatically concluded that in not one instance was it possible to show that pyorrhea or even an ordinary gingival inflammation had any causal connection whatsoever with traumatic occlusion.

The physical aspects of the book are excellent. It is neatly printed on high grade gloss paper and contains 227 most excellently reproduced photomicrographs. The organization of the book is beyond criticism. With the use of two sizes of type, the authors have effectively separated straight histologic descriptions from the text proper. This enables those who do not consider themselves capable of judging histologic interpretations to obtain a very satisfactory conception of the whole subject by reading only that which is printed in the larger type. The frequent use of sum-

maries after important descriptions is another feature which cannot be praised too highly.

There is but one possible weakness, and that is the question as to the application of animal findings to human conditions. The authors were conscious of this, and by their comparative study of man and monkey disposed of this criticism to some extent. The reviewer has but one regret: the fact that this book has not as yet been published in English.

EMIL MUELLER.

Toothsome Topics. By Clarence O. Simpson, M.D., D.D.S., F.A.C.D., Professor of Radiodontia in the Washington University School of Dentistry; Director of the Oral Diagnosis Section of the Soper-Mills Clinic, St. Louis; Author of "The Technic of Oral Radiography" and "Advanced Radiodontic Interpretation." 91 pages; price, $2.50. Published by The University Press, St. Louis.

This book, while of serious intent, is written for the most part in a lighter vein, and therefore it is calculated to entertain as well as instruct. It is intended to be used in the reception rooms of dentists for the enlightenment of the patients as they come to the office. The chapters are very short and full of meat, and therefore they will readily hold the attention of the chance reader.

The author has always been known for his pronounced individuality, and what he has to say is invariably interesting. A few extracts will serve to indicate the general trend in the treatment of the subject. Speaking of brushing the teeth, the author says:

"There are about as many ways of brushing teeth as of hitting golf balls, and likewise most of them are wrong. However, you can more easily learn to brush your teeth correctly than you can learn to hit golf balls, and the polish acquired with the toothbrush has more influence upon your life than your golf score.

"If you are attracted by golf because you cannot master it, you will find the theory and practice of toothbrushing equally difficult and fascinating."

The chapter on "Injurious Dentifrices" is especially interesting. It does not inveigh with one sweep against the philosophy of all dentifrices as is the custom with some of our writers, but points out in few words the damage that may be done by injurious agents. The advice is timely.

As might be expected from Dr. Simpson's well-known interest in the roentgen rays, he strongly urges that all children from the age of 5 should have the benefit of periodic roentgen-ray examination. In this connection, he says: "The curiosity of mothers should be sufficient reason for the inspection. Daughters may be expected to have grotesque makeups and cigarette stains, and sons to have bald heads and trick moustaches, but only the x-rays can foretell what kind of teeth they will have."

The observation on toothpicks is characteristic and sensible. "The ban on toothpicks is an illustration of etiquette which does not promote physical welfare. If food packs between or lodges around the teeth, it should be removed." Toothpicks are now "confined to primitive rural communities, cheap restaurants and dining cars, but lobster and chicken remain as harassing foods."

One thing is certain—there is not a dull chapter, not even a dull sentence, in this book. This is so unusual that we can only commend the book and advise that it be read.

Principles and Practice of the Dental Assistant. By Samuel Fine, D.M.D., Graduate of Harvard University Dental School; Councillor in the Massachusetts State Dental Society; Former School Dentist and head of the Coolidge Dental Clinic in Fitchburg, Massachusetts; Member of the American Dental Association and the Harvard Odontological Society. 66 pages; 18 illustrations; price, $3. Published by the Hamilton Publishing Co., Worcester, Mass.

This is a concise manual of dental assisting containing many valuable bits of every day information that will prove of service to any dental assistant. It can be read through at one sitting or it can be dipped into at odd times with profit. Much of the information contained in the book has been presented from time to time through papers in the periodical literature, but it will all bear repeating and emphasizing, and it is presented in such readable form that it is more readily available than anything in our magazine literature.

Fifty Years of the A. D. T. A. Compiled by a committee composed of John L. Brewster, Lawrence W. Dunham, D.D.S., and Merwin B. Massol, Chairman. Published by the American Dental Trade Association.

This is one of the most beautiful volumes that has come to the editorial desk for many a day. It consists of 136 pages of text and illustrations, and the format is beyond all praise. It contains portraits of the leading members of the A. D. T. A., and many groups

of men and women from the various meetings, with a running comment on matters connected with the association. It recites the development of the organization, its steady growth and the very excellent work that it has done. All along the line it has formed an integral part in the advancement of the dental profession, demonstrating a sympathetic and cooperative spirit whenever the interests of the trade and the profession have been under consideration.

This book will go a long way toward cementing more closely than ever the ties of the members of the A. D. T. A. and will tend to link up all of the various groups concerned with the growth and stability of the manufacturing and merchandising interests of the dental trade and the dental profession.

The reviewer does not know the price of this book. He did not dare ask, because he knows something of the cost of book-making.

SOCIAL INSURANCE AND THE FUNDAMENTAL PRINCIPLES OF DEMOCRATIC GOVERNMENT

By Edward H. Ochsner, M.D., Chicago, Ill.

All forms of social insurance are contrary to the spirit of democratic government. They destroy individual incentive, initiative and self reliance. They substitute paternalistic control for independence of thought and action. We pride and congratulate ourselves on living under a democratic form of government, but most of us fail to realize that we are slowly but surely drifting away from the true democratic spirit in government—that we are gradually substituting therefor a hybrid form of government, a cross between bureaucracy and socialism. Personally, I am a firm believer in democracy and I consider that many of our present ills are the direct result of our already having deviated too far from the fundamental principles of democracy.

Individual responsibility is the foundation of democratic government. If a nation does not educate its citizens to individual responsibility, it will soon have no one capable of assuming public responsibility. Slowly through the ages, the common man has risen from chattel slavery and serfdom to independence, freedom and personal liberty; and now some well-meaning but misguided people wish to undo all this. They desire to enslave him again, making him in fact a bondsman of the state. Organized society is forever forging new chains with which to impede the free development of its members. It is forever meddling with the private affairs of its citizens. One of the best illustrations of this statement is found in a recent survey of the Citizens' Bureau of Milwaukee, which found that that city is engaged in approximately 300 different functions, one fifth of which have been added during the last sixteen years. Milwaukee is no worse in this respect than many other cities in this country. Add to this fact the activities of the county, state and federal governments, and we find an explanation of the following: "In a period in which the population of the United States has increased 10 per cent, the number of persons holding civil office has increased 40 per cent and the amount paid in salaries has increased 150 per cent." Thirty years ago, one person in every forty-five was in government employ, while now one in every twelve is so employed.

"It is a profound mystery why the people of the present generation should so violently run after the very things their forefathers so violently ran away from in 1776. One of the chief indictments of King George set forth in the Declaration of Independence reads: 'He has erected a multitude of new offices and sent hither swarms of officers to harass our people and eat out their substance.'"

In a recent article, Harry Emerson Fosdick makes a statement that seems particularly suitable in this connection: "Many of those in society who are dissatisfied with present conditions know what they want to get away from, but they do not know whither they are going." I would add "nor do they seem to have any clear idea as to what they want." Before we adopt new laws, we should make reasonably sure that such laws will not introduce new and greater evils than they are expected to cure; that they can actually be enforced, and that they are not likely to be abused in their administration.

A far-reaching innovation such as social insurance must be viewed from many angles. We must consider its effect on the general public, the insured, the employer and the medical and dental professions.

If we are deliberately trying to get away from the democratic form of government having a definite objective in view; and if we are reasonably certain that the goal for which we are headed is worth while and our attainment of it is going to result in general social and economic betterment, an experiment with social insurance might be justified; but, even then, it is well to weigh and consider care-

fully what the wise founders of our government had to say on this important subject. I quote from the Declaration of Independence: "Prudence, indeed, would dictate that government long established should not be changed for light and transient reasons." If we a nation are just aimlessly drifting, as we seem to be, we are almost sure to get into serious trouble. I believe that I shall be able to show conclusively, in future articles, that in those countries in which social insurance has had prolonged and extensive trial, it actually has had serious consequences. The latter problems will be taken up in subsequent articles.

DENTISTS AMONG RECENT CONTRIBUTORS TO GENERAL LITERATURE

By J. A. Salzmann, D.D.S., Philadelphia, Pa.

Two worthwhile additions to American literature have recently been published from the respective pens of A. I. Tobin, Brooklyn, N. Y., and Gustav Eckstein, Cincinnati, Ohio. Both authors are practicing dentists.

Dr. Tobin, with the collaboration of E. Getz, a Chicago attorney, has written "Frank Harris—A Study in Black and White." This volume presents an intimate and interesting account of the life of a man who is famous as an editor, short-story writer, Shakespearean scholar and bon vivant. Interesting personalities in the literary world, from Bernard Shaw down, are to be met with in the pages of this book. Dr. Tobin is the "authorized biographer" of Frank Harris. The book is published by Madelaine Mendelsohn, Chicago.

Dr. Eckstein is the author of "Noguchi." This book gives a vivid and interesting portrayal of the life, and to some extent, the work of this famed Japanese scientist who rose from the obscure position of janitor at the Takayama (Japan) Dental School to teacher in that institution and finally to the rank of leading bacteriologist of the Rockefeller Institute. Incidentally, it was Dr. Kirk, then dean of the University of Pennsylvania Dental School, who befriended Noguchi when most American scientists considered him beneath their notice and who encouraged Noguchi toward greater achievement.

The dental profession may well feel proud of these authors and their respective books.

CORRESPONDENCE

Swindling Shoe Salesman Apprehended

To the Editor: In this month's JOURNAL, page 173, there appears a notice regarding a shoe swindler. Perhaps you will be interested to know that this shoe swindler visited me on January 2 and I placed an order with him. On Tuesday, January 5, I received THE JOURNAL and, as I opened it, the warning regarding the shoe swindler confronted me. I telegraphed to the company that the salesman was supposed to represent and on receipt of their wire informing me that he was a fraud, I placed the matter in the hands of the police, and one-half hour ago, he was arrested in my office. He had evidently returned looking for more victims.

It most certainly pays to read THE JOURNAL.

GLEN PATTON
407 Hopkins Bldg.
Bakersfield, Calif.

Jan. 6, 1932.

NEWS

Roentgen-Ray Picture Taken in One-Thousandth Second: A new Westinghouse three element x-ray tube and machine makes possible the taking of a roentgen-ray snapshot in less than one-thousandth second. This enables physicians to see clearly, for positive diagnosis, the inside of a human body, up to this time blurred or hidden in roentgenograms by the motion of the patient's muscles. This new instrument was shown for the first time at the Convention of the Radiological Society of North America at St. Louis. This newest aid to science is the invention of Montford Morrison, Westinghouse X-Ray Company, and Dr. C. T. Ulrey of the Westinghouse Lamp Company. An interesting feature of this new apparatus is that it can be operated from an ordinary house lighting circuit and in appearance resembles a large size radio tube. The method of operation is similar to the collecting of water behind a dam. When the accumulated electricity behind the dam is sufficient, the dam is opened; which sends the power suddenly, like a bolt of lightning, through the tube, and the snapshot is produced.

Atlanta Midwinter Clinic: March 14 and 15, a memorial meeting will be held in Atlanta, Ga., in honor of the late Thomas P. Hinman, who organized the clinic eighteen years ago, and who was its sponsor till his death. There will be a two days' meeting, and the night of the 14th will be set aside for a memorial occasion. This midwinter clinic has proved to be one of the most successful and inspirational agencies for the welfare of dentistry that has ever been inaugurated in

the South; and in holding this memorial it is intended to give recognition to the genius of Dr. Hinman for organization work. M. D. Huff has been made chairman to succeed Dr. Hinman.

Free Dental Treatment for the Unemployed: The Chicago Dental Society recently voted to donate dental service to persons whose inability to pay for such care is certified to by accredited social agencies. The service will be given by members of the dental society either in their private offices or at the dental college clinics, the latter to accommodate the emergency cases. An emergency relief fund is to furnish funds to defray the cost of materials used in the cases cared for in the dental schools.

Section Officers, A. D. A., for 1932: The following have been elected as officers of the scientific sections of the 1932 Annual Session of the American Dental Association, to be held in Buffalo, September 12-16: Operative Dentistry, Materia Medica and Therapeutics: E. L. Knox, Dallas, Texas, chairman; R. W. Edwards, Kansas City, Mo., vice chairman; J. C. Lupton, Cleveland, Ohio, secretary. Full Denture Prosthesis: Clyde H. Schuyler, New York City, chairman; Bert L. Hooper, Lincoln, Nebr., vice chairman; Harold L. Harris, St. Paul, secretary. Partial Denture Prosthesis: A. L. Walters, Tulsa, Okla., chairman; Herbert E. King, Omaha, Nebr., vice chairman; Ralph C. Cooley, Houston, Texas, secretary. Oral Surgery, Exodontia and Anesthesia: E. C. Hume, Louisville, Ky., chairman; Frank W. Rounds, Boston, Mass., vice chairman; Harry Bear, Richmond, Va., secretary. Orthodontia: Ernest N. Bach, Toledo, Ohio, chairman; Henry F. Hoffman, Denver, Colo., vice chairman; O. W. Brandhorst, St. Louis, Mo., secretary. Periodontia: Edward C. Ball, Cincinnati, Ohio, chairman; M. Monte Bettman, Portland, Ore., vice chairman; Grace Rogers Spalding, Birmingham, Mich., secretary. Mouth Hygiene and Preventive Dentistry: E. H. Early, Darlington, S. C., chairman; W. C. McBride, Detroit, Mich., vice chairman; L. W. Morrey, Chicago, Ill., secretary. Histology, Physiology, Pathology, Bacteriology and Chemistry (Research): T. A. Hardgrove, Fond du Lac, Wis., chairman; E. D. Coolidge, Chicago, Ill., vice chairman; Theodore B. Beust, Louisville, Ky., secretary.

Dental Economics in New Zealand: It is announced from New Zealand that the Government is practically certain to demand payment in future from persons availing themselves of public dental clinics, as part of the policy of reducing the cost of state social services. The Prime Minister of New Zealand has announced his intention of reducing expenditures by £1,250,000, which will entail the curtailment of some of the money grants made for the maintenance of social services, and the elimination of others. It is announced further from what is described as an authoritative source that the heavy cost of dental clinics, which are held to be nonproductive, has led the Government to decide to recover some of this cost by compelling the people who take advantage of these services to pay something towards its maintenance. There is apparently the same problem in New Zealand as in Great Britain to make ends meet, and the dental profession cannot fail to feel some effect, however slight, in the amount of dental treatment given when it ceases to be gratuitous.—*Dental Surgeon.*

Tablet Dedicated to Mr. Eastman: A tablet was dedicated to Mr. George Eastman, January 9, by the Rochester Dental Society, at the Rochester Dental Dispensary, Rochester, N. Y., in appreciation of his services to dentistry and the public. A dinner was given at which Bainess A. Goldblatt presided. The dedicatory address was presented by Martin Dewey, and George Vanderpool and Chester F. Hummell also spoke. The tablet bears this inscription: "This tablet is erected by the Rochester Dental Society in appreciation of the sympathetic understanding and generosity of George Eastman who, because of his belief in the value of preventive dentistry and children's dental service has provided the building, equipment and endowment of the Rochester Dental Dispensary for the benefit of the children of this city."

ANNOUNCEMENTS

CALENDAR OF MEETINGS

American Dental Association, Buffalo, N. Y., September 12-16.

American Board of Orthodontia, Toronto, Canada, May 16-17.

American Dental Society of Europe, Baden-Baden, Germany, August 9-11.

American Society of Orthodontists, Toronto, Canada, May 18-20.

Central Pennsylvania Dental Society, Altoona, February 29-March 1.

Dental Clinic Club of Philadelphia, February 16-19.

Four State Postgraduate Clinic, Washington, D. C., March 29-31.

Great Lakes Association of Orthodontists, Detroit, Mich., February 29-March 1.

Italian Stomatologic Congress, Rome, September.

Kings County Dental Society of Brooklyn, N. Y., February 25-27.

New York Society of Orthodontists, New York City, March 9-10.

Pacific Coast Society of Orthodontists, San Francisco, February 18-20.

Society for Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

Thomas P. Hinman Midwinter Clinic, Atlanta, Ga., March 14-15.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

February

Minnesota, at St. Paul (24-26).
Oregon, at Salem (25-27).
Pennsylvania, at Lancaster (4-5).

March

Connecticut, at New Haven (March 30-April 1).

April

Alabama, at Birmingham (12-14).
California, at Oakland (4-6).
Kansas, at Wichita (25-27).
Kentucky, at Louisville (4-6).
Louisiana, at Monroe (14-16)
Michigan, at Detroit (11-13).
New Jersey, at Atlantic City (13-15).
Oklahoma, at Muskogee (19-23).

May

Illinois, at Springfield (10-12).
Indiana, at Indianapolis (16-18).
Iowa, at Des Moines (3-5).
Maryland, at Baltimore (2-3).
Massachusetts, at Boston (2-5).
Missouri, at Joplin (16-18).
Nebraska, at Lincoln (16-19).
New York, at Albany (11-13).
North Carolina, at Elizabeth City (2-4)
South Carolina, at Greenville (23-24)
South Dakota, at Sioux Falls (16-18)
Texas, at Dallas (17-20).
Vermont, at Burlington (18-20)
Virginia and West Virginia, at Winchester, Va. (16-18).

June

Arkansas, at Little Rock (6-8)
California (Southern), at Los Angeles (13-15).
Colorado, at Estes Park (20-22).
Georgia, at Atlanta (8-10)
Maine, at South Poland (16-18).
Montana, at Bozeman (June 30-July 2)
Nevada, at Reno (4).
New Hampshire, at North Conway (1-3).
Wisconsin, at Milwaukee (7-9)
Wyoming, at Thermopolis (27-28).

July

Washington, at Seattle (5-9).

STATE BOARD OF DENTAL EXAMINERS

Indiana, at Indianapolis, June 15. J. M. Hale, Secretary, Mt. Vernon.

Iowa, at Iowa City, May 30-June 2. Hardy F. Pool, Secretary, Mason City.

Kansas, at Wichita, April 25-27. Fred A. Richmond, Federal Reserve Bldg., Kansas City.

Kentucky, at Louisville, June 8-11. Robert

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

L. Sprau, Secretary, 970 Baxter Ave., Louisville.

New Jersey, at Trenton, June 27-July 2. John C. Forsyth, Secretary, 148 W. State St., Trenton.

Pennsylvania, at Pittsburgh and Philadelphia, June 16-20. W. A. McCready, Secretary, 1115 Highland Bldg., Pittsburgh.

LOUISIANA STATE DENTAL SOCIETY

The annual meeting of the Louisiana State Dental Society will be held April 14-16, at the Hotel Virginia, Monroe.

JULIAN S. BERNHARD, *Secretary*
Medical Arts Bldg.
Shreveport

IOWA STATE BOARD OF DENTAL EXAMINERS

The next examination of applicants to practice dentistry in Iowa will be held at the State University of Iowa College of Dentistry, Iowa City, May 30-June 2. Applications properly executed, together with college diploma and fee of $25 must be filed with the State Department of Health at least fifteen days prior to date of examination.

HARDY F. POOL, *Secretary*
Mason City

SOCIETY FOR ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

The next meeting of the Society for the Advancement of General Anesthesia in Dentistry will be held at the Essex House, New York City, February 29; dinner at 7 and scientific session at 8 p. m. For reservations, address

M. HILLEL FELDMAN, *President*
730 Fifth Ave.
New York City

CENTRAL PENNSYLVANIA DENTAL SOCIETY

The thirtieth annual convention of the Central Pennsylvania State Dental Society will be held at the Penn Alto Hotel, Altoona, February 29-March 1.

R. B. COOPER, *Chairman*
Publicity Committee
317 Howard Ave.
Altoona

GREAT LAKES ASSOCIATION OF ORTHODONTISTS

A meeting of the Great Lakes Association of Orthodontists will be held, February 29-March 1, at the Hotel Statler, Detroit, Mich. For further information, address

STANLEY A. MACKENZIE, *Sec'y-Treas.*
1011 Stroh Bldg.
Detroit, Mich.

WYOMING STATE DENTAL ASSOCIATION

The Wyoming State Dental Association will hold its seventeenth annual meeting in Thermopolis, June 27-28.

E. C. ANDREW, *Secretary*
212 Hynds Bldg.
Cheyenne

INDIANA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Indiana State Board of Dental Examiners for examination of applicants for licensure in Indiana will be held, June 15, beginning at 8 a. m., in the House of Representatives Room in the State House, Indianapolis. For information, applications, requirements, etc., address

J. M. HALE, *Sec'y-Treas.*
Mt. Vernon

DENTAL INTERNSHIP

The position of dental intern at the Lenox Hill Hospital will be vacant, September 1. The term of service is one year, with full maintenance. Apply in writing not later than March 15 to

GEORGE F. SAUER, *Superintendent*
112 E. 77th St.
New York City

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY

The State Board of Registration and Examination in Dentistry of New Jersey will hold its regular examinations, at Trenton, June 27-July 2. The examination fee is $25; reexamination fee, $10. Applications must be filed complete ten days before the date of examinations. Address all communications for further particulars to

JOHN C. FORSYTH, *Secretary*
148 West State St.
Trenton

KANSAS STATE DENTAL ASSOCIATION

The sixty-first meeting of the Kansas State Dental Association will be held at the Allis Hotel, Wichita, April 25-27.

FRED A. RICHMOND, *Secretary*
305 Federal Reserve Bldg.
Kansas City

PENNSYLVANIA STATE BOARD OF DENTAL EXAMINERS

The Pennsylvania State Board of Dental Examiners will hold its next examinations, June 16-20, at Philadelphia and Pittsburgh. Applicants should address the Department of Public Instruction, Harrisburg, for the necessary blanks and on return of same with fee and photographs at least ten days before the date of examination, instructions, order and place of examinations will be sent to applicant.

W. A. MCCREADY, *Secretary*
1115 Highland Bldg.
Pittsburgh

THE AMERICAN DENTAL SOCIETY OF EUROPE

The next annual meeting of the American Dental Society of Europe will be held in Baden-Baden at the Kurhaus, August 9-11. General headquarters during the meeting will be the Brenners Stephanie Hotel.

DAWSON BUCKLEY, *Secretary*
25 Blvd. Victor Hugo
Nice, France

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

The ninth annual meeting of the American Dental Hygienists' Association will be held in Buffalo, N. Y., Sept. 12-16.

AGNES G. MORRIS, *Secretary*
886 Main St.
Bridgeport, Conn.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

The eighth annual meeting of the American Dental Assistants Association will be held in Buffalo, N. Y., September 12-15. For further information address

RUTH M. CLARK, *General Secretary*
Scofield Bldg.
Minot, N. D.

AMERICAN PUBLIC HEALTH ASSOCIATION

The American Public Health Association, oldest and strongest organization of its kind on the continent, will hold its sixty-first annual meeting in Washington, October 24-27. The scientific programs are planned to interest health officers, nurses, food and nutrition experts, sanitary engineers, school physicians, directors of hospitals, laboratories and clinics, child and industrial hygienists, and specialists in all branches of public health. Additional information may be obtained from the office of the American Public Health Association, 450 Seventh Ave., New York City.

F. D. I.: COMPETITION IN ROOT CANAL WORK
Method for Verification of Root Canal Treatment

For verification of a given procedure for root canal treatment, at least two dogs, aged 1-2 years, should be employed for histologic-bacteriologic experiment. It is suggested that the lower cuspid, first molar and third molar on each side be treated. On one side, the treatment should be carried out on the teeth in the natural state. On the other side, the pulp should be extirpated and the root canal infected with a strain of *Streptococcus viridans* previously isolated from infected human teeth and known to be virulent for dogs.

The bacteriologist, who will make the definitive tests, must furnish the examined strain and be present when the culture is introduced into the dog's teeth and must mark the dog for later identification. In addition to the teeth mentioned the upper cuspids should be infected similarly. The teeth should be sealed with an appropriate filling. Roentgenograms should be made at varying intervals. Evidence of periapical lesions indicates the time to commence root canal treatment (not under three months). The two upper infected incisors should not be treated, remaining a potential focus of systemic infection.

One and one-half years after the completion of root canal treatment, roentgenograms should be made and the animals should be killed. From the animal, the lower first and third molars on both sides should be procured for histologic examination, while, from the lower cuspids cultures should be obtained for bacteriologic study. From the second animal, the lower cuspids should be taken for histologic examination, while the lower first and

third molars on both sides should be examined bacteriologically. The materials for investigation should consist of all the teeth mentioned above (upper cuspids) together with their surrounding tissues, and the lower cuspids and first and third molars. Similarly, the upper cuspid and first molar should be obtained from each side, from one for bacteriologic, from the other side for histologic control.

For the bacteriologic examination, it is suggested that the apices of the teeth be amputated with a rigidly aseptic technic, and pulverized, and the material used for cultures. The tissues around the apex should be scraped and this material also used for cultural purposes, in accordance with a procedure described by Rosenow. The bacteriologic examination must be carried out by the head of the department of bacteriology of the university or institute nearest the place at which the work is to be done. The material may be prepared for histologic examination in any laboratory having adequate facilities. Only serial sections can be presented for control. The material to be examined histologically must consist of the root apex with its surrounding soft and hard tissues.

The detailed description of the method of treatment, the serial section and the results of the bacteriologic examinations must be in the hands of the president of the scientific commission of the F. D. I. not later than Aug. 1, 1935. In the meantime, on recommendation of the scientific commission, the executive council of the F. D. I. will designate the members of the committee which is to make the award. To this committee will be reserved the right of controlling the contest in any way they see fit. They will be particularly concerned with the practicability of the proposed methods. The award will be made as soon as the committee has finished its work.

OFFICERS AND TRUSTEES OF THE AMERICAN DENTAL ASSOCIATION

1931-1932

PRESIDENT

Martin Dewey.....17 Park Ave., New York City

PRESIDENT ELECT

G. Walter Dittmar.....59 E. Madison St., Chicago, Ill.

VICE PRESIDENTS

John J. Ogden.....Sterick Bldg., Memphis, Tenn.
C. R. Lawrence.....American National Bank Bldg., Enid, Okla.
Sterling V. Mead.....1149 Sixteenth St., N. W., Washington, D. C.

SECRETARY

Harry B. Pinney.....212 E. Superior St., Chicago, Ill.

TREASURER

R. H. Volland.....Iowa City, Iowa

BOARD OF TRUSTEES

Martin Dewey, President, Ex-Officio.....17 Park Ave., New York City
G. Walter Dittmar, President Elect, Ex-Officio...59 E. Madison St., Chicago, Ill.
Harry B. Pinney, Secretary, Ex-Officio.....212 E. Superior St., Chicago, Ill.
R. H. Volland, Treasurer, Ex-Officio.....First Nat. Bank Bldg., Iowa City, Iowa
C. E. Rudolph, '34.....905 Metropolitan Bank Bldg., Minneapolis, Minn.
John F. Stephan, '34.....1034 Keith Bldg., Cleveland, Ohio
George B. Winter, '34.....Frisco Bldg., St. Louis, Mo.
Albert W. Crosby, '34.....215 Whitney Ave., New Haven, Conn.
Edward H. Bruening, '33.....620 City National Bank Bldg., Omaha, Nebr.
Harvey J. Burkhart, '33.....Box 35, East Avenue P. O., Rochester, N. Y.
W. O. Talbot, '33.....Medical Arts Bldg., Fort Worth, Texas
Arthur Cornelius Wherry, '33.....910 Deseret Bank Bldg., Salt Lake City, Utah
James A. Brady, '32.....2108 N. Broad St., Philadelphia, Pa.
Sheppard W. Foster, '32.....849 Peachtree St., Atlanta, Ga.
Frederick H. Lum, Jr., '32.....151 Main St., Chatham, N. J.
C. N. Johnson, '32.....212 E. Superior St., Chicago, Ill.
J. J. Wright, '32.....1218 Wells Bldg., Milwaukee, Wis.